GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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Editorial Notes.

"Freedom Has a Thousand Charms to Show."

THESE notes have of late called attention to the general dissatisfaction which pervades the gas industry at the side-tracking of its legislative proposals and the questionable justice of withholding from it a measure of rating relief, albeit some 25 p.ct. of the industry's activities is manifestly productive. Now it is observed that at recent meetings of shareholders in gas companies the chairmen have taken advantage of the opportunity of expressing their views with regard to the attitude of studied neglect of the gas industry which has been displayed by the present Government. These chairmen are to be congratulated upon their action; for no useful purpose will be served by keeping silence. The loyalty of the industry to this Government has never been called in question, and that it has rendered great assistance to those in authority in times of stress cannot be gainsaid. Thus during the war its resources were freely and effectively put at the disposal of the Government; and during the industrial upheaval which followed the war it provided on several occasions a steadying influence by continuing in face of great difficulties to perform its duties to the vast public which it serves. It is therefore with surprise—and, indeed, with some indignation—that the industry finds its requests for the amendment of the out-of-date legislation under which it operates persistently ignored by the Government.

The justice and reasonableness of these demands are admitted by all who understand the position; and we believe they have even been blessed in a large measure by the relevant Department of the Board of Trade. They involve no pledging of public money, as was the case with the Electricity Supply Act, 1926, when £33,000,000 was made available for the schemes of the Central Electricity Board, amid a flood of oratory in high places which might well have led the uninstructed to imagine electricity as the panacea for all the ills to which the nation is heir, and to regard other sources of heat, light, and power as obsolete. The truth, of course, is that, thanks to its efficiency and vitality, the gas industry is far from being obsolete. It is, in fact, continually progressing, in spite of the difficulties under which it has to work. At the same time, its full development as a great national supply service is being seriously hampered by the continuance of restrictions which, however necessary they may have been in 1847 and 1871 (the years in which the two Gas-Works Clauses Acts were passed), cannot now be justified. Gas can no longer be regarded as a monopoly, the granting of which must be hedged about with meticulous safeguards; nor is it without competitors.

The industry should therefore be granted the reasonable measure of commercial freedom which other industries enjoy. Such freedom can easily be given without removing adequate safeguards of the interests of gas consumers and of shareholders in gas companies; and when granted it will enable gas undertakings to meet their competitors on an equal footing, and to expand in a manner beneficial to all concerned. All that is needed to secure this desirable end is the expenditure of a small amount of parliamentary time. Admittedly, Parliament is heavily charged with work at present; and it may be that a measure embodying the whole of the National Gas Council's proposals is not at the moment practicable. But surely the Government can find time, without further delay, for a short remedial Bill which would meet the industry's most urgent needs. Such a measure would not only be an earnest of the more ample legislative amendment which eventually must be secured, but it would immediately relieve the strain which is being placed upon the loyal feelings of one of the country's largest and most useful industries.

Carbonization as a Tar Cracking Process.

THE William Young Memorial Lecture delivered in brilliant fashion by Mr. E. V. Evans at the annual meeting of the North British Association of Gas Managers is an admirable tribute to a great man—one who, in the words of the lecturer, was the Michael Faraday of the gas industry. Mr. Evans has the rare distinction of combining penetrating technical vision with grace of style in its interpretation—a fact which was appreciated by all who were fortunate in attending the Edinburgh meeting, and will be evident to those who read the lecture, which is published in our columns to-day. Concluding his remarks, the lecturer observed that advancement in knowledge is now the result of the combined effort of a body of investigators, and no longer does one individual lay claim to particular discoveries regarding the carbonization process. While this is true, it does not imply any less need for individual effort, or any less credit to the man of imagination who is able to direct the energies of others into more productive channels. After all, group research is no new thing; Aristotle had an army of collaborators, and doubtless a goodly portion of the canvases of Leonardo da Vinci, that serene genius quoted by Mr. Evans, was covered by his band of pupils.

From the technical aspect, the lecture is fascinating; and it requires no gift of prophecy to say that it will be carefully studied by all our readers. The major theme is that development in the carbonization process was immediately accelerated when the thermal conception was adopted and the shackles of the illuminating-power convention, which so grievously aggravated the problems which William Young had to face, were discarded. The usual outlook on the process is that it is one in which the thermal energy of the original coal is distributed into gas, tar, and coke. This idea, however, belies the extremely important part played by the free carbon; and the accurate conception, as Mr. Evans observed, is to regard carbonization as the distribution of energy into four compartments—gas, tar, coke, and free carbon. The efficiency of the process from the gas-maker's point of view depends on the control of the cracking of the primary

tar (an unstable body, not to be confused with low-temperature tar, into which it can be converted by contact with material heated to 550° C.) produced when coal is heated at temperatures below 500° C. The efficiency of the cracking process, in its turn, depends not only on temperature, condition of the charge, and so on, but also, as Mr. Evans emphasized, on the concentration of hydrogen in the gas during the operation.

Consideration of the influence of hydrogen on the cracking process is perhaps the most intriguing section of the lecture, for it offers such interesting possibilities. Coal may be distilled at low temperatures, and the resulting tar cracked at about 800° C. in its nascent state in a hydrogen atmosphere of definite concentration. This tar will then yield the normal amount of high-temperature tar, together with 57 therms of rich gas. If, said Mr. Evans, the hydrogen be supplied in the form of water gas, and 40 therms of the latter be employed, there will result 97 therms of 500 B.Th.U. gas per ton of coal carbonized (106 therms on the dry, ash-free basis), and the solid product remaining will be a true low-temperature coke. Maybe the application of this principle will affect the future of low-temperature carbonization in its relation to the gas industry. An alternative method outlined by the lecturer would be to employ for the cracking of the low-temperature tar hydrogen produced by high-temperature carbonization and steaming of the solid product made at the lower temperature. This, of course, would be a two-stage process of carbonization. However, without going into any further detail, it can be said that the lecture calls attention to "the secret of the effective carbonization of coal—the carefully controlled cracking of hydrocarbons in the presence of hydrogen," and indicates with what scientific vision William Young predicted the principles of carbonization as they are known to the gas industry to-day.

The Sulphate of Ammonia Situation.

MR. GEORGE BRAIDWOOD'S excellent paper on the manufacture of sulphate of ammonia in gas-works, presented at the meeting of the North British Association of Gas Managers last Thursday, once again focuses attention on a serious problem which confronts all gas undertakings and which is of particular import to the smaller concerns. Only a few years ago the profit earned by many undertakings by the conversion of ammonia into sulphate represented as much as 18 p.ct. of the cost of the coal carbonized. To-day, even the large works consider themselves fortunate if their ammonia recovers 5 p.ct. of the cost of the coal; and as for the small undertakings, they are working their systems either at no profit or actually at a loss. That a solution to the problem must be found is obvious, for some method of treating the crude ammoniacal liquor is essential before it can be passed into streams or sewers. Moreover, the present difficulties are not in the least likely to be ameliorated in the future, when it is borne in mind that the hoped-for output of synthetic ammonium sulphate in 1930 at the Billingham Works of Imperial Chemical Industries amounts to 2100 tons per day, or over 750,000 tons per year.

What is to be done? To our mind there are two methods of attack. One is to increase the economic efficiency of sulphate units as operated in gas-works at present; the other is to investigate the possibilities of conversion processes by which ammonia or ammonium sulphate may be transformed into more marketable commodities, and of large central plants producing sulphate without using sulphuric acid. To revert to Mr. Braidwood's careful account of his plant at Coatbridge, the author shows that if, among other factors, full advantage is taken of surplus steam generated in waste-heat boilers, sulphate plants with an output of about 350 tons and over per year can still make a reasonable profit, allowing for the interest on, and heavy depreciation common to, such plants. His figures demonstrate once again that steam economy is essential to cheap salt production, and point to the great need for a crude liquor of greater strength than is made in several works operating sulphate plant in the country to-day. Mr. Thomas Glover, in the course of a valuable discussion on the paper, referred to this, and mentioned that a drawback to carbonization in vertical retorts with steaming—perhaps, he observed, the only drawback—is the weak liquor which results. The question arises, Why produce this weak liquor? If it is not essential to rid the gas of practically every trace of ammonia before it enters the oxide purifiers—and there seems little reason to assume that it is absolutely necessary to do this—then a liquor of considerably greater strength can be made. This matter was discussed by Mr. H. Hollings before The Institution of Gas Engineers at Cardiff last June, and it is surprising that no reference to it was made at the meeting of the North British Association last Thursday. Mr. Hollings has shown that if it is permissible to allow (say) a maximum of 5 grains of ammonia per 100 c.ft. of gas to pass forward from the ammonia washing system to the oxide purifiers, "it would be possible to recover the rest of the ammonia from the gas without the introduction of fresh water for washing, provided that the temperature is kept reasonably low and that a washing liquor containing no more 'free' ammonia than the equivalent of about 1·5 oz. strength could be procured from some other part of the system."

The general trend of the discussion on Mr. Braidwood's paper indicated that few small concerns can show a profit on sulphate production. Mr. John Wilson, of Motherwell and Wishaw, mentioned that if the capital costs of the plant have already been paid off, the manufacture of sulphate pays; but this can hardly be regarded as an economic argument. It appears, then, that the small undertakings might do well to concentrate on the production of a strong liquor for transport to a central works where full advantage could be taken of large-scale operation and new processes. In respect of the larger works, scrupulous attention to detail—such care as is obviously exercised at Coatbridge—is capable of turning what may be doubtful economic enterprise into profitable venture.

World Power Conference and the Gas Industry.

THERE will be found in the "Correspondence" column of this issue a letter signed by four of the leading authorities on fuel problems, in which attention is called to the importance of the World Power Conference on Fuel, to be held in London (at the Imperial Institute) from Sept. 24 to Oct. 6. This letter brings out two facts which are particularly deserving of emphasis. In the first place, the conference is international, and is, we understand, supported by no fewer than forty-five countries. It will therefore give us the opportunity in Great Britain of learning something of the progress that is being made in other parts of the world. Secondly, it enhances the value of the contributions to be presented at the conference to find that each is put forward "with the authority of some technical body in the particular country from which the paper originates."

When one pauses to consider the magnitude of the conference, with its 150 papers from different parts of the world, the first thought is that the members of the conference may be submerged in a medley of incoordinated papers, however good. It is therefore of interest to note the means by which the organizers have ensured that the actual sessions of the conference shall be of maximum value. This has been done by arranging that at the various sessions none of the actual papers are to be read, but that instead of this there shall be presented a general report on the group of papers which is to come up for discussion at that particular session. These general reports for the different sections will discuss the scope of the papers and the trend of development, and bring out the important features, thus affording material for discussion. By this means a section which contains (say) a dozen papers will be reviewed and thrown open for discussion in about twenty minutes. Readers will agree with us that this arrangement offers the only sound solution of the problem of preventing the business of the sessions becoming merely the reading of lengthy summaries by the various authors. The difficulty of language has been overcome by presenting each paper with a summary in a language different from that adopted in the full text. Thus the organizers would seem to have done all in their power to ensure that those attending the conference, whether

from home or abroad, may derive the maximum value and enjoyment.

From the point of view of the gas industry, there are a number of contributions of outstanding value. Considerations of space will prevent us from publishing more than a certain number of the papers; but realizing that the conference is an event of unusual importance, we have decided to make it a special feature of the issues of Sept. 26, Oct. 3, and Oct. 10. It is proposed to deal with a group of subjects in each of these numbers. Thus on Sept. 26 there will be published the two general reports relating specially to the "Carbonization Industries" and "Gas Manufacture" (covering some thirty papers), together with certain outstanding papers. The issue of Oct. 3 will contain the general reports relating to "Fuel Utilization," with the leading papers on the subject. In the third number the intention is to cover certain other outstanding subjects, such as "Transmission of Power," "Waste-Heat Recovery," and "The Economic Possibilities in the Better Co-ordination of Fuel Utilization." This programme has, however, been mapped-out without any certain knowledge of the amount of matter that will be involved.

There is one further feature of the conference which is worthy of note. The Technical Committee appointed a Special Sub-Committee to examine the possibilities of producing a book on Technical Data relating to fuel. By pooling the knowledge of the leading organizations on fuel, such a book has, we understand, actually been produced, under the title of "Technical Data on Fuel," and will be available to members of the conference at the favourable price of 7s. 6d. a copy. Compiled by men engaged on the technical side of the various branches of fuel production and utilization, there is no doubt that the volume will fulfil a very useful purpose and will be eagerly sought after.

In commending the conference to the attention of the gas industry, we use with confidence the words of the distinguished representatives of fuel research, iron and steel research, the oil industry, and the gas industry—"to miss this World Power Conference is to lose a golden opportunity of acquiring, within the space of a few days, a fuller realization of world knowledge on fuel matters."

Big Gas Consumptions.

Emphasis was laid by Mr. Thomas Hardie in an address to the members of the Western Junior Gas Association, and later by Mr. H. D. Madden in his Presidential Address to The Institution of Gas Engineers, upon the large gas consumptions *per capita* in the United States of America, where the cost per 1000 c.ft., generally speaking, does not compare favourably with charges levied in this country, and where the consumption of electricity is from three to four times greater than it is here. The figures quoted were: Washington, 12,837 c.ft.; San Francisco, 12,392 c.ft.; and New York, 12,325 c.ft. A week or two ago, it was pointed out that even these gratifying consumptions were exceeded in the case of the Consolidated Gas, Electric Light, and Power Company of Baltimore, who reported a consumption *per capita* for 1927 of 13,708 c.ft. These statistics were used to point a moral, if not to adorn a tale; but while it is perfectly true, as we have already remarked, that the figures should be kept in mind, as showing what gas may hope to accomplish under suitable conditions, it should also be remembered that the highest consumption above mentioned is well surpassed in this country by the Bath Gas Company, whose consumption, based on the estimated population to-day of the area supplied, works out at 14,500 c.ft. *per capita* for 1927. As the result of canvassing and propaganda, the consumption of gas in Bath has increased greatly since the war; the figure *per capita* in 1914 having been only 8700 c.ft. There may, of course, be other instances in this country of as handsome a reward following so enterprising a policy as that pursued by the Bath Gas Company.

The "N.B." Meeting—A Personal Note.

It was agreed by all who were fortunate enough to find their way to Edinburgh last week that the sixty-seventh annual meeting of the North British Association was a great success; and the President, Mr. H. H. Gracie, and the Council fully deserved the warm thanks which they received. But it is the rank and file, no less than the officers, who influence the virility and utility of such an Association, and in the North British is to be found the spirit of fellowship and mutual help which means so much. Thus this national gas association of Scotland is able to work the maximum of good among undertakings the great majority of which are small—as judged (say) by the 20-million standard—and many of which are scattered in districts not so accessible as the Thames Valley; and the gas industry north of the Tweed presents a very solid and powerful front. Our report of the proceedings and our comments upon the valuable technical communications appear elsewhere; here we wish to strike a personal note. In the first place, there was keen disappointment that the President-Elect, Mr. J. W. Napier, was unable to be present on the occasion of his election to the chair—he is at present with the Chemical Engineers on tour in Canada. The members were able, however, to accord a very hearty welcome to the President of The Institution of Gas Engineers; and no one was in disagreement with Mr. Terrace's observation that it was fitting that his first official visit should be to the North British Association. For the first time the details of the meeting were in the hands of Mr. Kellock, for Mr. Fulton has passed on the secretarial portfolio after eight years' diligence, and is now Senior Vice-President of the Association.

Thirty-Three Years Ago.

One whom all were glad to greet was Mr. Alexander Wilson, now an Honorary Member of the Association, but thirty-three years ago the President, when he was Manager of the Dawsholm Station of the Glasgow Gas Department. The latter he served for thirty years, during sixteen of which he was the Chief. In 1895, the year of Mr. Wilson's presidency, the annual meeting was held in the Corn Exchange, Melrose, then reckoned to be a "somewhat out-of-the-way locality." Our records show that after the meeting the members and their friends dined together in the George Hotel, and that "on the following day there was an excursion to Abbotsford; but, owing to the very unfavourable weather, only a comparatively small number—perhaps a little more than fifty—took part in the trip. Rain fell the whole time, so that the visitors could only apply themselves to what was to be seen indoors. This was soon accomplished, and the party were set down at the hotel door in Melrose exactly two hours from the time they had left it." *Autres temps, autres mœurs*; and Mr. Alex. Wilson will grudge neither the reference to that meeting nor the fair weather which favoured the excursion last week.

Gas Education in Scotland.

The Scottish District Committee for the Institution Education Scheme have no easy problem to solve, for gas undertakings are scattered and distances very long in the greater part of Scotland; but much progress has been achieved, and the number of students now coming forward is satisfactory. Courses are given at the Royal Technical College, Glasgow, and the Heriot-Watt College, Edinburgh; and during the past year representatives of the Committee, strongly assisted by Mr. James Dickson, the Gas Engineer at Dundee, negotiated with the Dundee Technical College, with the result that classes in gas engineering and gas supply will commence next winter session. That the heart of the industry in Scotland is in the task before them is proved by the fact that up to June of this year no less than £400 had been contributed by gas undertakings towards the financial assistance of Technical Colleges which can maintain classes. It is hoped that honest endeavours will be rewarded. Glasgow and Edinburgh have plenty of students; let Dundee follow the example.

Norwegian Gas-Works and Differential Prices.

At the meeting of the Norwegian Gas Association a year ago, there was appointed a Committee whose task was to settle the question of a basis for a more uniform price policy for the gas supplied by the Norwegian undertakings; and in this issue of the "JOURNAL" we are able to give a full translation of the report containing the result of their deliberations. This report, which was submitted at last month's meeting of the Association, is noteworthy as affording evidence of general recognition that there is need for reconsidering methods of

gas charge. The reasons for this feeling, as explained by the Norwegian Committee, are that the old unit prices do not meet present-day requirements, that they have proved unsuitable in competition, and that they have not obtained for the gas undertakings the increased consumption which is necessary for their continued existence and development. It is recognized in Norway that the electrical industry have for a number of years adopted a more effective price policy than the gas industry; and obviously the latter cannot afford to be left behind in so vital a matter. Something must, and will, be done to meet the position; but the Norwegian Association are out for uniformity in whatever steps may be taken, and in this it seems that they are wise—at any rate, so far as broad outline of policy is concerned, though modifications may be necessitated by local conditions. It is to be noted that in the case of the Norwegian Gas-Works it is the domestic consumption—which for most of them is the dominating factor—that has more especially failed during recent years; and consequently it is here that encouragement is in the first place considered necessary. So many proposals have been put forward in different places that the Committee have been rather overwhelmed. They do make certain suggestions; but at the present stage it is their recognition of the need of some change which is of most importance.

Value of Research.

It was a weighty Presidential Address that Sir William Bragg delivered last Wednesday evening to the British Association, in conference at Glasgow. It is clear from what he said that, if industry is to progress, nothing must be allowed to interfere with the growth of science. New applications of scientific knowledge, new ideas, new processes, and new machines must, he declared, always be in preparation. Thus we see the meaning of the various research organizations which have been set up in the basic industries—such as the Fuel Research Board, the Cotton, the Woollen, and the Silk Research Associations, and the research laboratories of the steel masters at Sheffield. Much of our hope for the future is built upon their work. "Should it not," asked the President, "be our policy to take advantage of our country's qualities by continually seeking for fresh industries or fresh adaptations of the old? We should not, surely, cling to old activities when they have reached the stage in which many others have learnt to do them with equal efficiency, and when we can go on to something new and, it may be, more difficult. We can, of course, bolster-up old industries by political methods; and I have no wish to decry such methods as always incorrect. But clearly the best protection of all is the knowledge and skill which can enable us to produce what others must ask us for because they cannot so well make it themselves." Pursuing his subject, the President said that a new class of worker was growing up, consisting of the men engaged in research associations and industrial research laboratories throughout the country. A high value must be placed on their services, for they were actually and personally bringing back with them into craftsmanship the scientific knowledge which was one of its essentials. They brought the interest and the outlook of scientific inquiry into touch with both employer and employed, and he thought that they might be, to some extent, the flux that would make them run together.

ON THE ELECTRICAL SIDE.

Coal Prices and Heating Stoves.

The domestic consumer, who has of late years become so much more used to the term "increase" than the word "decrease" in relation to the price of his commodities, has during the past few weeks been favoured through the medium of his favourite newspapers with the intimation that his coal is going to cost him more. It is, in all conscience, costing him enough already, in comparison with what it did in "the good old days;" but he is in all probability as ready as anyone else to admit that there has been reasonable cause for a substantial increase in price. With all that he has been, and is being, told, however, with regard to the disproportion at the present time between supply and demand, he may be excused if he wonders what is the precise cause of this threatened further advance. At the same time, it is not to the cause of higher priced coal, but to its effect, that we would now invite the attention of our readers. The apparently inspired notices that have been appearing in the newspapers during the last little while have not escaped the electrical Press; and in one quarter the hope is expressed "that vendors of electric heating appliances will quickly turn to account the advantageous opportunity thus presented." What the vendors of electric heating appliances may be able to do in this way, surely those interested in gas heating apparatus will be in a position to cap! It is just as the early mornings and late evenings become a little chilly that the electric fire becomes of greatest value to large numbers of consumers who, our contemporary points out, "cannot afford to keep it going for whole-day service in the winter." Even assuming that there are far fewer people who cannot afford to use gas fires continuously, the argument nevertheless applies with sufficient force to the gas industry to make it desirable to follow the lead of our electrical friends in this matter. Let gas undertakings also, therefore, follow the advice extended to local electrical contractors and dealers—that they should make full use of this talking point just now.

Overhead Transmission.

A certain liveliness is apparent at the moment on the vexed subject of overhead electric transmission lines. The prospect of seeing these wires stretched all over the land is evidently—to put the matter mildly—not universally pleasing. Those who have seen such transmission lines will have some feeling of sympathy with the objectors—that is, if they do not happen to subscribe to the claim that a thing of use must necessarily be a thing of beauty. But obviously sentiment cannot be permitted to govern a matter of this kind, and if usefulness and beauty are at loggerheads, then, within reasonable limits, usefulness must have preference. In another age, beauty may reign supreme; but many things will have to change before that time arrives. However, such objection to overhead lines as we have just referred to does exist—we have it on the authority of the "Electrical Times"—even on the part of "penny-farthing parish councils." Precisely what a "penny-farthing parish council" may be, we do not know; but clearly it is something which, it is considered, has no right to object to its area being bespattered with glorified clothes lines.

But more important bodies also have their opinions; and Liverpool has been expressing its views through the Town Clerk (Mr. Walter Moon), to the local Chamber of Commerce. These views, be it noted, go far beyond the mere question of overhead transmission. The Corporation, said Mr. Moon, objected to a city like Liverpool having to import from outside stations, as far distant as 26 miles, between 60 and 70 p.ct. of the city's electricity requirements. They had arranged to erect a super station at Clarence Dock, on the distinct understanding that the requirements of Liverpool would be supplied locally. The Corporation had made strong representations that a city of the importance of Liverpool should not be dependent upon overhead transmission lines—especially as they were preparing to construct one of the most modern stations in an ideal position, on the side of the Mersey, where the cost would be very much less than in any other station in the north-western area. Mr. Moon declared that if Liverpool were to bear the cost of constructing the station, it should be worked at its maximum load. They were advised by the Electrical Engineer that the Commissioners thought it would be too great an advantage for Liverpool over Manchester and other places. The Chamber passed a resolution to support the Corporation, on the ground that the proposals of the Central Board were inimical to the interests of the city. Here are all the elements of an exciting discussion.

There is yet another aspect of the overhead transmission system that has received notice within the past few days. It appears that at a Ministry of Transport wayleave inquiry, into an application by the Leicester and Warwickshire Electric Power Company, a landowner claimed that he was entitled to a royalty on all the electric energy transmitted across his land. The reports indicate that the suggestion was not enthusiastically received; and probably one would not be far wrong in assuming that no more will be heard of it. Taking one thing with another, however, it is clear that all is not plain sailing, and perhaps electricians are pardonably a trifle peeved. We are sorry, nevertheless, to see this peevishness go so far as to lead a contemporary to make the assertion, in a reference to overhead wires, that "evidence is not lacking that gas interests are actively fomenting some of these anti-electric agitations." The gas industry itself is not entirely free from blame in the matter of "spoiling the amenities of the district" by the erection of structures which are as essential to it as are doubtless, in many parts of the country, overhead transmission lines to the electrical industry. Gas undertakings frequently have to face objections to proposals to erect new holders; but they face these

objections without attempting to drag their electrical friends into the quarrel. Assuming, as we certainly do, that our contemporary is correct in stating that "from all parts of the country come instances of local opposition to the placing of overhead electric lines," there must be some deeper reason than the "underground opposition" which is alleged.

Reduction in Lamp Prices.

We learn from "The Times" that "Elma," the Association of Lamp Makers which controls the manufacture of incandescent electric lamps in this country, announces immediate reductions in the price of vacuum and gas-filled lamps. Ordinary vacuum lamps of 25 and 40 watts, for pressures of 100 to 130 volts, are reduced to 2s. each, while those for 200 to 260 volts are reduced to 2s. 2d. The reductions vary in the case of pressures below 100 volts; but where lamps of standard ratings are concerned, they average 2d. each. For gas-filled lamps of 40 and 60 watts, which are the sizes largely used in houses, offices, and shops, the reduction for the higher pressures is 5d., so that they now cost 2s. 3d. each. For 100 volts the same lamps are reduced in price to 2s. 1d. and 2s. 3d. respectively. Lamps of which the bulbs are "pearled," or internally obscured, cost no more for standard pressures and ratings than those in clear glass.

SOCIETY OF BRITISH GAS INDUSTRIES.

Council Meeting.

A Meeting of the Council was held on Tuesday, Sept. 4, at 56, Victoria Street, Westminster, when there were present Mr. R. J. Milbourne (Chairman) in the chair, Mr. C. A. Goodall (Vice-Chairman), Dr. E. W. Smith (Hon. Treasurer), and Messrs. R. B. Hodgson, C. R. F. Threlfall, George Clark, Charles S. Bennett, B. B. Waller, Thomas A. Braddock, Samuel Cutler, J. Winson Scott, H. Talbot, G. Ewart, A. H. Lymn, E. J. Davison (Hon. Secretary), and Arthur L. Griffith (Secretary).

Apologies for absence were reported from Messrs. H. M. Thornton, Frank West, E. J. Fox, G. J. Jackson, and F. Dobson.

The minutes of the previous meeting were confirmed and signed.

The Chairman spoke in feeling terms of the great loss the Society and the whole of the gas industry had sustained by the death of Mr. Arthur F. Bezant, Editor of the "GAS JOURNAL," who was such a good friend to the Society and whose help and advice were always of real value. The Secretary attended the funeral, and a wreath was sent on behalf of the Society. Letters of sympathy had been sent to his relatives and to the "GAS JOURNAL," and acknowledgments were read.

At the request of the Chairman, the members rose in their places as a mark of respect.

The Chairman read the following letter from Sir Arthur Duckham in reply to the resolution of congratulation and good wishes sent to him on his appointment as leader of the Economic Commission to Australia.

> Dear Mr. MILBOURNE,—Will you please tell your Council how much I appreciate your kind resolution, and thank them for their expressions of goodwill and appreciation.
>
> It is most gratifying to me the way that all my friends feel that an honour has been paid to the gas industry as a whole through my being selected as the leader of this Mission to Australia.
>
> I trust I may meet you again, on my return, with all my other friends in the industry, and be able to give you some ideas on Imperial development.
>
> Yours sincerely,
> ARTHUR DUCKHAM.

NEW MEMBERS.

Applications for membership were considered, and the following firms were unanimously elected members of the Society:

Koppers Coke Oven Company, Ltd., Sheffield, under Sections I., II., and III.

John G. Stein & Co., Ltd., Bonnybridge, Scotland, under Section X.

INTERNATIONAL ILLUMINATION COMMISSION.

Correspondence was submitted in reference to the International Illumination Commission at New York this month. Mr. H. Talbot, who had been nominated the Society's representative, had made all arrangements to go out, but owing to unforeseen circumstances had been obliged to cancel them, and there had been great difficulty in getting anyone to take his place at short notice. Mr. Robert Watson, of Doncaster, who is representing The Institution of Gas Engineers, had now kindly agreed, with the consent of the Institution, to represent the Society as well.

A contribution was voted to the Illuminating Engineering Society in response to their appeal for increased membership, and Mr. F. J. Gould was nominated as the Society's representative member.

The minutes of the Local Sub-Committee of the Gas Industries Section of the British Industries Fair, Birmingham, 1929, and the report of Mr. R. J. Rogers were submitted, and matters in relation thereto were discussed.

AUTUMN GENERAL MEETING.

Arrangements for the Autumn General Meeting to be held at the Hotel Cecil on Thursday, Nov. 22, under the Presidency of the Marquess of Hartington, M.P., were reported.

PERSONAL.

Mr. T. F. CARSWELL has relinquished the office of Hon. Secretary and Treasurer to the Scottish Junior Gas Association (Western District), and Mr. A. BUJNOWSKI, of Glasgow, has taken over the duties.

OBITUARY.

The death occurred at Nottingham, on Sept. 3, following an operation in a nursing home, of Alderman HAROLD GOVER FORD, who had been for a long period associated with municipal work. As a member of the Corporation Gas Committee, and in other capacities, he rendered services of great value to the city.

It is with regret that we have to record the decease of Alderman ALEXANDER WILKIE, C.H., of the Newcastle-upon-Tyne Corporation, late M.P. for Dundee, and for many years Chairman of the Public Lighting Committee of the City of Newcastle, which position he held up to the time of his death. Alderman Wilkie took a keen interest in the public lighting of his city, and was instrumental in bringing the Association of Public Lighting Engineers to Newcastle for their annual meeting and conference in 1926. The late Alderman had the distinction of being the first Labour M.P. for Scotland. For his services during the war the King appointed him Companion of Honour.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Sept. 19.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meetings of the Executive and General Committees, at 28, Grosvenor Gardens, S.W.

Sept. 27.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION.—Meeting at Porthcawl.

Oct. 3.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Oct. 11.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Autumn meeting in Birmingham.

Oct. 16.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at 28, Grosvenor Gardens, 2.30.

Oct. 18.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Autumn meeting in London.

Oct. 22-24.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Conference at York.

Nov. 22.—SOCIETY OF BRITISH GAS INDUSTRIES.—Autumn general meeting. Hotel Cecil.

THE INSTITUTION OF GAS ENGINEERS.

All meetings take place in the Council Room at 28, Grosvenor Gardens, unless otherwise stated.

Sept. 11.—Benevolent Fund Committee of Management.

Sept. 18.—Finance and Executive Committees in the morning; Council meeting in the afternoon.

Wales and Monmouthshire District Institution.—The autumn meeting of the Wales and Monmouthshire District Institution of Gas Engineers and Managers will take place at Porthcawl on Thursday, the 27th inst. In addition to other business, a paper will be read by Mr. David Muir, of Pontypridd, on "Low-Temperature Carbonization."

Transactions of the Australian Gas Institute, 1927.—This volume, which is a record of the work of the Institute during the period 1926-27, when Mr. A. Wilson, M.Inst.C.E., was President, shows how the activities of the organization are growing. The reports of the annual sectional meetings alone occupy some seventy pages.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

ANNUAL MEETING IN EDINBURGH.

The Sixty-Seventh Annual General Meeting of the North British Association of Gas Managers was held in the Masonic Hall, George Street, Edinburgh, on Thursday, Sept. 6, under the presidency of Mr. H. H. Gracie, Engineer and General Manager of the Edinburgh Corporation Gas Department. Mr. Gracie was accompanied to the platform by Mr. John Terrace, President of The Institution of Gas Engineers; Councillor Angus N. Gregorson, Convener of the Edinburgh Gas Committee; Mr. E. V. Evans, Joint Manager of the South Metropolitan Gas Company (the William Young Memorial Lecturer for the year); Messrs. James Bell, Dumbarton; A. S. Nisbet, Paisley; S. Milne, Aberdeen; David Fulton, Helensburgh; A. Wilson (late Gas Manager of Glasgow); John Wilson, Motherwell and Wishaw; H. G. Ritchie, Falkirk; J. J. Scott, Cowdenbeath; J. Dickson, Dundee; and R. M. Simpson, Denny.

A WELCOME.

The PRESIDENT at the outset expressed his pleasure at seeing such a large and representative attendance of members of the Association. In the unavoidable absence of the Lord Provost of the City of Edinburgh, they were honoured that morning in having with them Councillor Gregorson, the Convener of the Gas Committee.

Councillor GREGORSON said that he understood this was their sixty-seventh annual meeting, so they were becoming quite a venerable body. On that point he did not suppose that the allotted span of human life applied to an Association such as theirs; and thus they might hope long to continue selling gas for the benefit of the human race as at present. As regards the Corporation of Edinburgh, that body only took over the Gas Department of the city eight years ago. A year later Mr. H. H. Gracie, whom the members of the Association had honoured by selecting him to the presidential chair, was appointed Gas Engineer and Manager. Since then the progress of the Gas Department had been great and continuous. He was not going into figures, but would content himself by remarking that progress had been most satisfactory from all points of view; and he thought that remark applied generally to the gas industry all over the country.

The PRESIDENT, in acknowledging the welcome, said the members greatly appreciated the words of encouragement that had been spoken by Councillor Gregorson. They were glad to know that the Gas Convener regarded their industry as being such a thriving and reliable one; and they could assure Councillor Gregorson that it would always be the aim and object of the members of the Association to provide an ample supply of gas at as low a charge as possible to the consumers.

THE NEW SECRETARY.

The PRESIDENT, in calling for the minutes of the last meeting, introduced the new Secretary and Treasurer, Mr. Archibald Kellock, of Airdrie.

Mr. KELLOCK said he hoped the good relationship which had started that morning would long continue, and that in the end he should leave them as happily as he was taking up his new official position.

The minutes were read and unanimously approved.

APOLOGIES FOR ABSENCE.

Among the apologies for absence was one from the President-Elect, Mr. J. W. Napier, of Alloa, who cabled from New York as follows:

> Best wishes to President and members for successful Edinburgh meeting. Engaged for past three weeks industrial tour of Eastern Canada and United States with Canadian, American, and British Chemical Engineers.

Other apologies were intimated from Messrs. J. W. McLusky, Glasgow; W. Doig Gibb; Thomas Carmichael, Portsmouth; H. Pooley, Leicester; Samuel Glover, St. Helens; R. W. Cowie, Hawick; C. Valon Bennett, Rochester; A. Mackay, Stoke-on-Trent; Octavius Thomas, Rhondda; H. C. Smith, Tottenham; H. G. Colman, London; John Armour, Paisley; and John Webster, Port Glasgow.

ANNUAL REPORT AND ACCOUNTS.

The PRESIDENT said that the Annual Report of the Council, together with the usual statement of accounts had been circulated. It was gratifying to note that the membership of the Association was still increasing satisfactorily, and a number of additional names would be submitted for their approval in the course of the proceedings. The financial aspect of the Association was one for congratulation; it would be observed that there was a substantial sum in hand in connection with each of their various activities. The Education Scheme was working more smoothly—a number of the difficulties which confronted them at the outset having been got over. In this connection he might point out that Committees had been formed for dealing with any further matters which might require attention from time to time. The number of students attending the technical courses was satisfactory, but he was sorry to say that the examination passes were not yet up to expectations. It would be noticed that in addition to Glasgow and Edinburgh, classes in gas engineering and supply were to be held in Dundee Technical College; and their thanks were due to Mr. James Dickson, of Dundee, for arranging this matter, which had involved considerable time and patience. From the report it would be observed that the Council had appointed Mr. Archibald Kellock, of Airdrie, as Secretary and Treasurer; and there was recorded in the report a high appreciation of the valuable services rendered to the Association by Mr. David Fulton during his eight years of office.

Mr. WILLIAMSON (Forres) thought the President was wrong in stating that the membership of the Association was increasing satisfactorily. As a matter of fact, the number of ordinary members—and that represented the actual membership—was less than formerly.

The PRESIDENT expressed sympathy with the critical observations Mr. Williamson had made in regard to the ordinary membership. To some extent the objection raised by the speaker would be removed at a later stage of the proceedings, as several additional names would follow to be added to the ordinary membership. There was one way, however, in which the ordinary membership could be increased; and that was by each individual Manager who was a member endeavouring to bring a colleague and a non-member into the fold.

The adoption of the report and accounts was moved by Mr. WILLIAMSON, seconded by Mr. JAMES BELL, and carried unanimously.

NEW MEMBERS.

The following new members of the Association were then announced: Ordinary—Messrs. Thomas G. Moffat, Tradeston Gas-Works, Glasgow; W. H. Smith, Lochmaben; Robert S. Taylor, Aberlady; Thomas Glover, C.B.E., Norwich. Extraordinary—Messrs. L. P. M. Gardner, Sales Manager, Messrs. Milne's Meters, Edinburgh; Roland W. Broadhead, Managing Director, Messrs. Broadhead Constructions, Ltd., Manchester; Hugh C. Reid, Colliery Agent, 19, Waterloo Street, Glasgow; D. J. Thomson, Director, Messrs. A. & G. Anderson, 53, Waterloo Street, Glasgow; F. H. Wilkinson, Director, Messrs. George Waller & Son, Ltd., Stroud; Shaw Murray, Director, Messrs. Shaw Murray and Co., Colliery Agents, Glasgow; and Col. Alan Stein, Managing Director, Messrs. John G. Stein & Co., Bonnybridge.

THE LATE MR. A. F. BEZANT.

The PRESIDENT said that at this stage of the proceedings he would like to refer to the sudden death of Mr. A. F. Bezant, Editor of the "GAS JOURNAL." Mr. Bezant was well known to them all as a hard-working gentleman; and he gave great encouragement and assistance to the younger members of the profession. By all of them their friend would be very much missed.

Out of respect to the memory of the deceased, the members of the Association silently stood in their places.

PRESENTATION OF CERTIFICATES.

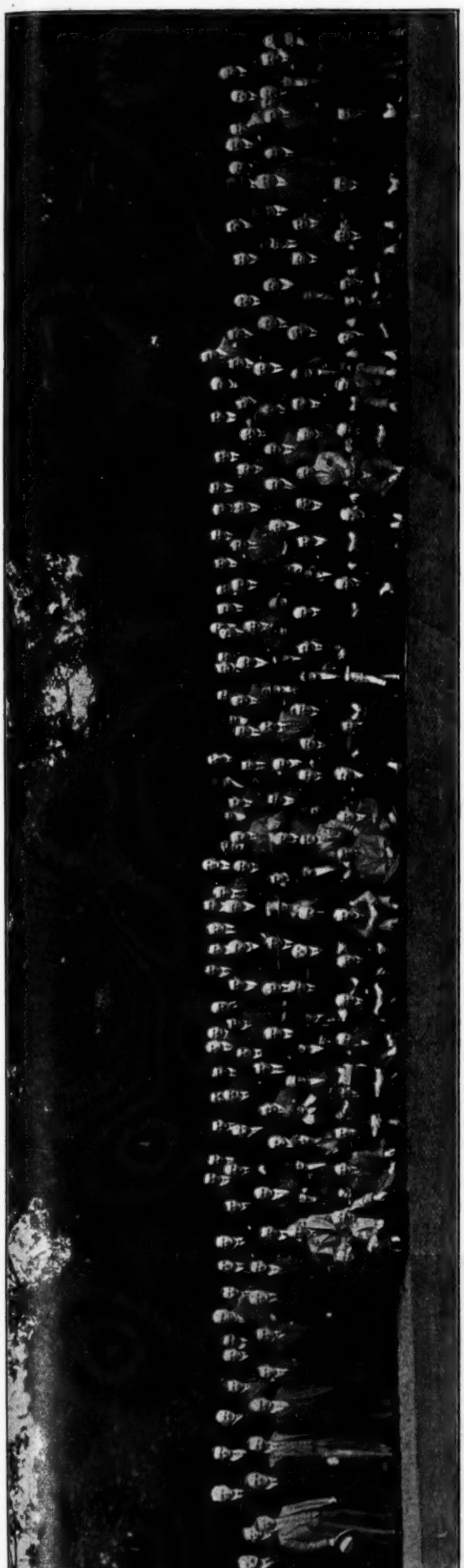
Education Scheme certificates having been awarded to Messrs. John Webster, John Armour, and Thomas M. Duncan, the first two were called to the platform and duly congratulated by the President. Mr. Duncan was unfortunately unable to attend owing to illness.

TECHNICAL COMMUNICATIONS.

"VALUATION AND TAXATION OF GAS UNDERTAKINGS," by Mr. R. M. SIMPSON, of Denny. This paper was presented at the Spring Meeting of the Association, and the text was published in the "JOURNAL" for Aug. 15 last. The discussion had been postponed till last week's meeting, when many interesting points were raised. Our report will be published next week.

The WILLIAM YOUNG MEMORIAL LECTURE was delivered by Mr. E. V. EVANS, Joint Manager of the South Metropolitan Gas Company. The lecture, together with ensuing comments, is reproduced elsewhere in this issue.

"QUALITY," by Mr. GEORGE BRAIDWOOD, of Coatbridge, was



AT EDINBURGH, SEPTEMBER 6.

presented and discussed at the afternoon session. Our report appears elsewhere in this issue.

NEW OFFICE-BEARERS.

At the close of the discussion on Mr. Braidwood's paper, the Secretary announced that the Scrutineers reported the result of the ballot as follows: President—Mr. J. W. Napier, Alloa. Junior Vice-President—Mr. H. G. Ritchie, Falkirk. Members of Council—Mr. L. Bain, Cullen; Mr. Allan Reid, Brechin; and Mr. R. M. Simpson, Denny. Messrs. Bain and Reid would hold office for three years, and Mr. Simpson for one year. Mr. David Fulton, of Helensburgh, retained office as Senior Vice-President.

It was further announced that Messrs. Spalding and Muir had been reappointed Auditors for the Association.

PRESENTATION TO THE PRESIDENT.

Mr. JAMES BELL, Dumbarton, as the immediate Past President, then presented to Mr. H. H. Gracie the memento of his year of office.

The PRESIDENT said this was a proud and happy moment in his career, and the handsome memento with which he had been presented would find a place among his greatest treasures. He had entered upon the duties of his office as President with considerable trepidation and hesitation; but now that he had finished, he could say in all sincerity that he was vacating the chair with regret. At the same time he would carry away with him many happy recollections.

NEXT YEAR'S MEETING.

The PRESIDENT said it was usual at the annual meeting to announce where the next meeting of the Association would be held. In the unavoidable absence of Mr. Napier, who was in America, it was not possible to make such an intimation.

VOTES OF THANKS.

The PRESIDENT said they were privileged in having with them Mr. Terrace, the President of The Institution of Gas Engineers. It was pleasing that Mr. Terrace should be with them, notwithstanding his multifarious duties and the calls upon his time. He believed this was the first occasion the President of the Institution had been present at the annual meeting of the North British Association; and certainly it was the first occasion on which Mr. Terrace had attended one of their meetings. He would ask Mr. Terrace to propose an omnibus vote of thanks to the authors of the papers, to the Scrutineers, and to the Office-Bearers and members of Council of the North British Association.

Mr. TERRACE, who was cordially received, said he was grateful for the opportunity of proposing this omnibus vote of thanks, and incidentally of making a few remarks on the occasion of his first visit to a meeting of the North British Association of Gas Managers. He valued the opportunity of speaking all the more because he had been connected indirectly with this Association almost from the time of his birth. In the early days of childhood he could recall that his father was one of the valued members of the North British Association. It was then he learned how much devolved on officers and councillors in making all the necessary arrangements for the annual meeting. It was the men behind the scenes who did not necessarily appear in the forefront at all who most deserved to be thanked. The period to which he referred was the day of Foulis of Glasgow, McCrae of Dundee, Stewart of Greenock, McGilchrist of Dumbarton, Watson of Stirling, and Smith of Aberdeen. These and a few others were the pioneers of old. If they were carrying on with the same efficiency as before, the credit was due to the Officers and members of the Council. Mr. Terrace concluded by moving the vote of thanks.

Mr. DAVID FULTON, Senior Vice-President, in acknowledgment, said that those of them who had been working on the Council were always thoroughly satisfied to see a good turnout of the members and to see an interest taken in the proceedings. That was what they hoped for and worked for.

The proceedings then terminated.

SOCIAL EVENTS.

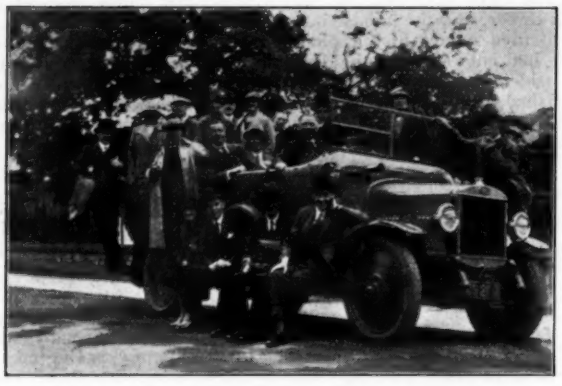
Excellent provision had as usual been made for the lighter side of the Annual Meeting, which began and ended in the open air; the bowling and golf competitions being held on the Wednesday. The ladies were that afternoon entertained to tea by Mrs. Gracie.

BOWLING AND GOLF COMPETITIONS.

The arrangements for the annual bowling competition, which was decided on the Grange Green, Edinburgh, were admirably carried out by the Secretary, Mr. Campbell F. Dunlop, of Glasgow. Play was keen, and no fewer than eight rinks took part. The finish was exciting, and victory eventually lay with the rink skipped by Provost Reid, of Brechin, who were 21 shots up. The skip had, as his supports, Messrs. John Ireland

(Carnoustie), Allan Hannah (Larbert), and Wm. Williamson (Forres). The runners-up, who were 20 shots up, proved to be a rink skipped by Mr. Smart, of Monifieth.

The Golf Circle, of which Mr. J. O. Scott, of the New Grange Meter Works, is Secretary, were fortunate in having obtained permission to hold the Annual Meeting at the Bruntsfield Links, which afford excellent golf and magnificent views of the Firth of Forth and the Fifeshire coast. The weather held up until late afternoon, and a thoroughly enjoyable day's play resulted. The Challenge Bowl, together with a replica, which was presented by the President of the Golf Circle (Mr. J. H. Kemp), was won by Mr. Stanley Bennet, of Edinburgh, who returned the splendid score of 70 (82–12). Other prizes were played for in two sections—handicaps over and under 15—and were awarded as follows (in order of merit): Section 1—A. B. Bradley, London; J. Carmichael, Barrhead; George Keillor, Greenock; James Bell, Dumbarton. Section 2—G. P. Mitchell, Blackburn; J. W. Scott, Stockport; W. B. Hudson, Manchester; R. W. Broadhead, Manchester. The Scratch Prize was won by Mr. Henry Rule, of Kelty, with the excellent score of 81.



The Challenge Bowl and prizes were, to the delight of all, presented by Mrs. Gracie; and thereafter the Annual Meeting was held, when Mr. James H. Kemp was re-elected President for the ensuing year.

THE PRESIDENT'S LUNCHEON.

On completion of the morning session members and their ladies repaired for a group photograph, which is reproduced here; and thereafter Mr. Gracie entertained some thirty guests to an informal luncheon party at the North British Hotel. Among those present were the Convener and Vice-Convener of the Corporation Gas Committee; Mr. John Terrace, President of The Institution of Gas Engineers; Mr. W. M. Mason, Manager of the "B.C.G.A.;" Mr. A. Wilson, formerly Engineer and Manager of the Glasgow Gas Department; Mr. Thomas Glover, C.B.E., of Norwich; and Mr. Walter Dunn, Secretary of The Institution. There was no formal speech-making; but Mr. Terrace paid a gracious tribute to Mr. Gracie and the North British Association, in the course of which he observed that it was particularly fitting that as President of The Institution and as a Scotsman he should pay his first official visit to their meeting.

A RECEPTION BY THE CITY.

On Thursday evening the Lord Provost, Magistrates, and Council of the City of Edinburgh entertained the Association in the City Chambers. Unfortunately the Lord Provost was unable to greet the guests, who were received by the senior Bailie and by Mr. and Mrs. H. H. Gracie. The visitors were permitted to inspect the historic rooms and paintings in the building; and the greatest interest was taken in the City Museum. Meanwhile, refreshments were served, and a delightful programme of music was played by Mr. Watt Jupp's orchestra.

THE SCOTT COUNTRY.

The weather had for some time previous to the meeting been the antithesis of which we in the South had enjoyed; and consequently the sunshine of Friday, which belied the earlier promise, was doubly welcome. A most interesting excursion into the country of Sir Walter Scott had been planned, and the arrangements went without a hitch, reflecting the greatest credit upon the new Secretary, Mr. Archibald Kellock.

Special saloon coaches were attached to the 10.10 a.m. train from the Waverley Station; and in these a party of about 130 members and ladies travelled to Melrose through a lovely countryside of hill and rushing burn. Arrived at Melrose they were met by motor coaches and conveyed to Abbotsford House, the residence of Sir Walter Scott, where he wrote the major part of his Waverley Novels. A thorough tour was made of the great author's library and living rooms; and the visitors displayed the keenest interest in an able guide's description of books, pictures, and relics. A return was then made to Melrose, where lunch was taken. The coaches left again at 2.30 p.m. for Dryburgh Abbey, the way to which lay over the Bemersyde Hill, which was Sir Walter Scott's favourite look-out and which now affords a near view of Earl Haig's Tweed-encircled estate. Passing through the leafy lanes down which the great soldier was borne to his rest, we came to Dryburgh Abbey and there stood before his grave, marked at his wish simply by a soldier's plain wooden cross and metal strip "Douglas Haig," and by the Flanders poppies fashioned by those for whom he gave so much.

Some time was spent among the picturesque ruins of Dryburgh Abbey; and then we drove back, to enjoy the further treat of an extended inspection of the historic pile of Melrose Abbey, and to be duly thankful that the Office of Works has so well in hand the restoration and preservation of the country's priceless treasures. After tea we once more entrained and arrived back in Edinburgh at 6.30 p.m., thoroughly satisfied with a day's excursion of which the time table had allowed the maximum enjoyment, for all could truly say they had "pursued the even tenor of their way."

Earl Haig's Tomb at Dryburgh Abbey.

WILLIAM YOUNG MEMORIAL LECTURE.

By E. V. EVANS, Joint Manager of the South Metropolitan Gas Company.

[Before the North British Association of Gas Managers in Edinburgh, Thursday, Sept. 6, 1928.]

As one having profound veneration for the old masters, whether they be artists or scientists, I am proud to be allowed to pay a tribute to the memory of William Young. I am doubtful, however, as to my ability to do justice to his memory, and my diffidence will be appreciated by those who, having been inspired in their own youth by the example and achievements of such men as Young, feel similarly unable to pay the homage due, in a manner conforming to their own ideals.

William Young was one of that small body of men who have in the very marrow of their bones the spirit of investigation; and it may well be said that he was the Michael Faraday of the gas industry, for, like Faraday, his ideas and enunciations have largely influenced progress in a great sphere of applied science. The investigations proceeding in the gas industry to-day are in many instances a simple extension or amplification of the basic principles conceived by Young. It is he who has placed his finger on what may be considered to be the secret of the effective carbonization of coal, and that is the *carefully controlled cracking of hydrocarbons in the presence of hydrogen;* and the more thoroughly we explore the process, the more convinced do we become of the importance of this.

Practically all the work of the gas industry during the last half-century upon the subject of the treatment of coal by heat has resolved itself into devising apparatus and plant in which the conditions of cracking are such that satisfactory yields of the desired products have been achieved. It may not have been generally realized by gas engineers that, in their endeavour to improve the existing methods of destructive distillation of coal, they have been faced with the problem of adjusting the decomposition and hydrogenation of the nascent hydrocarbon oils distilled from the coal. The difference between the heavy and the light charge of coal, between rapid and slow carbonization, between the continuous and the intermittent vertical retort, the effect of the temperature gradient throughout the coal charge, the conditions of temperature and time-contact in the cracking zones, whether in the free space of the retort or in the heated coal itself, all these constitute modifications in the process of resolving to simpler bodies the primary oils distillable from coal. The chemists of to-day who are engaged upon the study of the carbonizing process gain their experimental evidence by adjusting the conditions under which this decomposition takes place; but they are armed with a method of interpreting their results which would have been a golden key in the hands of Young.

It will be remembered that the whole method of interpreting the results of the carbonization process has been modified recently as the result of applying a thermal conception of the process. We now consider the carbonizing process to be one in which the thermal energy of the original coal is distributed into four compartments—gas, tar, coke, and free carbon. The gas and tar constitute the volatile portion, and the coke and free carbon the non-volatile portion. We include in the term free carbon the free carbon in the tar, together with the carbon adhering to the walls of the retort.

It is our practice to speak of the yield of gas and tar together as that of *volatile therms;* for experiment has shown that the method of treating this volatile portion subsequent to its evolution from the coal determines the ratio of gas to tar therms in the products of distillation, and the chemical and physical characteristics of each. From a given sample of coal it is possible to predict by experimental carbonization the optimum yield of volatile therms obtainable; and it is to be anticipated that this yield will not be materially augmented in the future. This statement refers to the destructive distillation of coal without the addition of extraneous agents such as hydrogen, steam, water gas, &c. The yield of gaseous therms may be apparently augmented by the production of water gas or producer gas within the coal charge undergoing the carbonization process. At the present time, the main advantage of purposely or inadvertently employing water gas or producer gas as a diluent is its scouring effect, which usually modifies in a desirable way the conditions of cracking. Thus by the distillation of coal in the presence of steam, the yield of volatile therms from the coal itself may be slightly increased; but the augmented yields of gaseous therms arise almost entirely from the water gas produced. It is this thermal conception of the products of distillation that has allowed us to understand the carbonizing process more clearly.

If I may digress for a few moments for the purpose of striking an analogy, I would refer to the greatest artist of all time, Leonardo da Vinci. This man, by his profound study of anatomy, and particularly of the anatomy of birds, directed his thoughts to the problem of flying, and subsequently enumerated the basic principles of æronautics. How different might have been the result of his work had he lived in these days of the internal combustion engine. William Young, by his study of the production of paraffin oil by the destructive distillation of shale, directed his thoughts to the problem of the manufacture of illuminating gas, and enumerated the basic principles of carbonization. How different might have been the result of his work had his problems not been aggravated by the necessity of maintaining in the gas manufactured a standard of illuminating power, without paying any heed to its calorific value.

It will be remembered that William Young, in his early years, was closely associated with the gas industry, and that while engaged as a Works Manager he observed at a neighbouring colliery a large wastage of shaley cannel coal, which he found subsequently could be utilized for the production of oil and of a gas of high illuminating properties suitable for lighting purposes. From that time he became immersed in the study of the problems of shale oil production, and left the gas industry. For years he laboured to produce economically from each ton of shale the maximum yield of paraffin oil which would be of such a standard of purity that the consumer would prefer it to the petroleum oils imported from America. It was by adjusting the conditions of cracking the distilled vapours that he eventually achieved his object.

To-day our problems are not materially different; for we may so adjust the carbonizing process that the quantity and quality of the three resulting products—gas, tar, and coke—will meet the requirements of market and consumer. A modification of the conditions of cracking is one of the means we adopt to achieve this end. It may be pointed out, incidentally, that we are still striving so to serve the British market that the quantity of imported petroleum products may be reduced to a minimum.

The main bye-product of Young's process was a gas rich in illuminating hydrocarbons, which resulted partly from the overcracking of oil vapours; and thus the conditions which gave him the greatest yield of gas were those under which the quality and yield of paraffin suffered most. For the conservation of the yield of paraffin oil, a restricted degree of decomposition was essential; and the process of oil production was the very antithesis of the process of manufacturing illuminating gas. It was as the result of having worked out the conditions most favourable to the one that he could prescribe those applicable to the other.

Will you now allow me to expound, in as few words as possible, some of the conceptions we possess to-day with regard to the possibilities of further improving the carbonizing process? It is hoped that, in bringing these conceptions to your notice, it may be possible to demonstrate to you that the lines of thought we are adopting to-day as a result of our chemical and physical investigations are not materially different from those of William Young.

PHYSICAL CHARACTERISTICS OF COAL.

As the first step in the development of this point, it will be necessary to deal with the present-day interpretation of the physical characteristics of coal. It is known that, by treating coal with certain organic liquids—notably pyridine—it is possible to effect a partial solution. This, it has been found, is not a true solution as ordinarily understood, but is a colloidal dispersion or colloidal solution. Perhaps, for the sake of clearness, it is desirable to add that colloids exhibit the property of dispersion in liquids comparable with the solution of a chemical compound such as sugar in water. They differ in respect of the size of particle dispersed; for in the case of a true solution—*e.g.*, sugar in water—the size of particle is that of the simple molecule, whereas the particles present in colloidal dispersion are usually aggregates of large numbers of molecules. It will be known to you, however, that these aggregates are themselves so small as to be undetected by the ordinary microscope.

In the course of experimental work, we have discovered a solvent in which as much as 90 p.ct. of the coal substance is taken into a state of colloidal dispersion; and this would seem further evidence in support of the hypothesis that coal is a colloidal body in a dried state. It may be depicted as a dried jelly which may be redispersed when treated with suitable agents under appropriate conditions.

Now, when this colloidal mass, coal, is heated to a temperature at which some preliminary decomposition takes place, a portion of it melts; and if there is sufficient of this molten material, it can permeate the whole mass, and cause the dispersion of the remaining portion. The separate particles of coal hereby lose their physical identity by fusion. This preliminary is essential to the formation of a coked mass; and the degree of dispersion determines whether a coal is coking or non-coking. It follows, therefore, that if in the case of a coking coal it were possible to remove the dispersing medium or its products of preliminary decomposition as quickly as formed, and thus avoid the accumulation of liquid within the

mass, we should be able to prevent coking. This is indeed an experimental fact. It is possible to remove, by special distillation methods up to a temperature of 500° C., the oil of a good coking coal without producing coke, while leaving a residue which, on further heating, also does not coke.

PRIMARY TAR.

This method of special distillation of coal is only of theoretical importance; but it is possible to distil coal to the same temperature in such a way that coking is achieved, but there is produced a primary tar possessing on condensation similar physical characteristics to the oil referred to above. It is quite different in its characteristics from the low-temperature tar produced by heating coal in the ordinary way to the same temperature. Whereas low-temperature tar is thin and fluid, this primary tar is thick and viscous, containing little or no free carbon, and having a specific gravity approximating to unity. The yield of primary tar will be about 50 therms per ton of coal substance, and it will be accompanied by about 25 therms of very rich gas.

At this stage it should be explained that the yields of products to be quoted refer unless otherwise stated to the ton of true coal substance—*i.e.*, to coal on the dry ash-free basis—and that the coal is a gas-making one of average quality mined in the County of Durham.

Particular interest is attached to the further treatment by heat of the solid residue remaining after the removal of this primary tar. By heating to 1000° C., no further oily products are evolved, but about 35 therms of a permanent gas is obtained. This gas contains 75-80 p.ct. of hydrogen and 20-25 p.ct. of methane, and is of poor quality, having a calorific value of about 400 B.Th.U. per c.ft. By this special treatment of coal up to a final temperature of 1000° C., it is thus possible to obtain :—

50 therms of primary tar
25 ,, ,, very rich gas
35 ,, ,, residual gas.

That is to say, 60 therms of gas and a total of 110 volatile therms.

Now, in carbonizing practice it is the method adopted to crack this primary tar into gas, tar, and free carbon that really determines not only the nature of the products, but also the efficiency of the process. It is unfortunate that we cannot isolate this primary tar and study how best to decompose it, for, being an unusually unstable material, its properties change on condensation, and any work done upon it must be carried out when it is in the nascent state.

LOW-TEMPERATURE PROCESS.

Now, if while in the nascent and vaporous state this primary tar be passed over a contact material, the products of its decomposition will be dependent upon the temperature of the contact mass and the time of contact. If, for instance, it is brought into moderately long contact with material heated to about 550° C., there will be produced about 10 therms of rich gas and 30 therms of another tar. The tar so produced, however, will now possess all the characteristics of low-temperature tar as manufactured in industry, and we shall have reproduced the low-temperature process, but in two stages, the first stage having given us

25 therms of very rich gas
50 ,, ,, primary tar,

while in the second stage the primary tar will have been resolved into :

10 therms of rich gas
30 ,, ,, true low-temperature tar.

The loss in thermal yield in the second stage will be accounted for by the formation of a pitchy residue incompletely decomposed at this temperature. The final yield of volatile products would thus be 35 therms of normal low-temperature gas and 30 therms (about 20 gallons) of normal low-temperature tar. It will be noted that the temperature of the contact material is about that at which the low-temperature process is conducted, and the yields are those obtained in the normal practice of low-temperature carbonization. It will further be appreciated that, if the coal carbonization process is arrested at a temperature of about 550° C., about 35 therms of residual gas will remain in the coke residue; and it is this that mainly accounts for the special properties of low-temperature coke.

The low-temperature process may therefore be shown diagrammatically, as in Table I.

HIGH-TEMPERATURE PROCESS.

Having dealt with the low-temperature process let us now pass the nascent primary tar over a contact material heated to 750°-800° C. Under these conditions the products when mixed with the residual gas obtained by heating the solid residue to 1000° C. will possess the characteristics of those of the high-temperature process, and the yields will be about the same. We should produce from the decomposition of the primary tar 25 therms of a rich gas and 20 therms of another tar (about 12 gallons) which would be similar in all respects to the high-temperature tar manufactured in horizontal retorts.

Here again, the process would have been reproduced in two stages, the first stage having given :

50 therms of primary tar,
25 ,, ,, very rich gas,

while the second stage resolved the 50 therms of primary tar into :

25 therms of rich gas,
20 ,, ,, high-temperature tar.

The loss in yield is accounted for by the formation of free carbon resulting from the process of decomposition; and this free carbon will be found partly in the tar as such or in the contact material which acts as a filter.

The high-temperature process may therefore also be shown diagrammatically, as in Table II.

It may be added that 85 therms calculated on the true coal substance is equivalent to about 74 therms per ton of coal as carbonized—a yield which is similar to that obtained by the carbonization of the same coal in horizontal retorts.

You may probably ask why we pass the primary tar over a material heated from 750°-800° C., when it is the practice to carbonize with an end temperature of about 1000° C. The answer is that experiment has shown that the most efficient cracking takes place at this temperature, and it is somewhat remarkable that during the period when tar is being evolved from the coal—which is perhaps 50 p.ct. to 60 p.ct. of the full carbonizing period in intermittently charged retorts—the maximum temperature in the mass of partly carbonized coal is about 800° C. Cracking of the nascent oils therefore takes place

TABLE I.

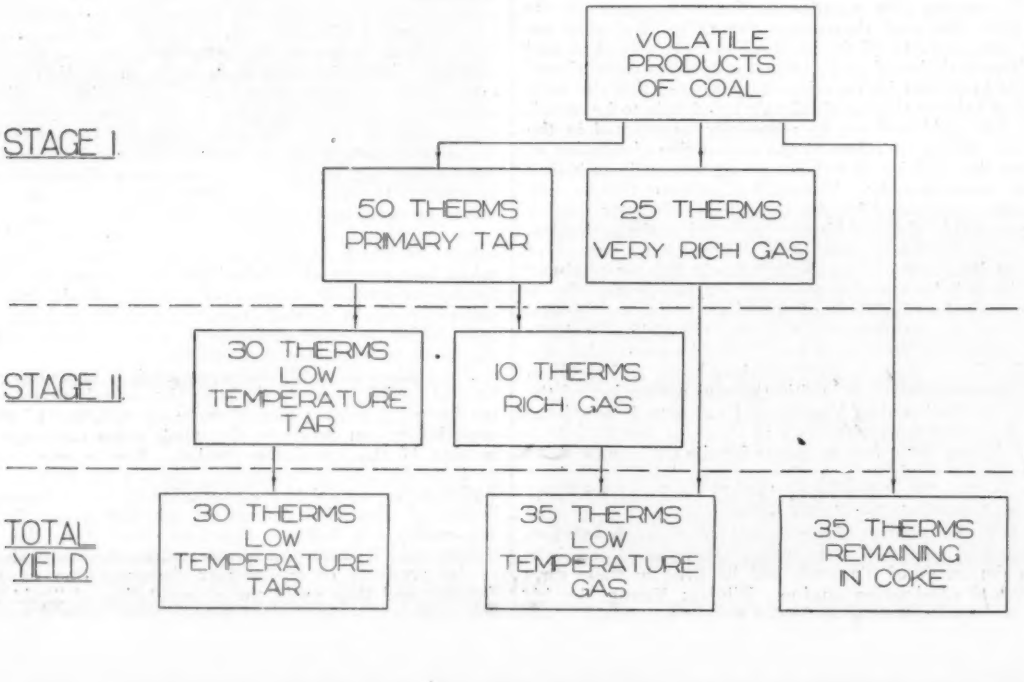
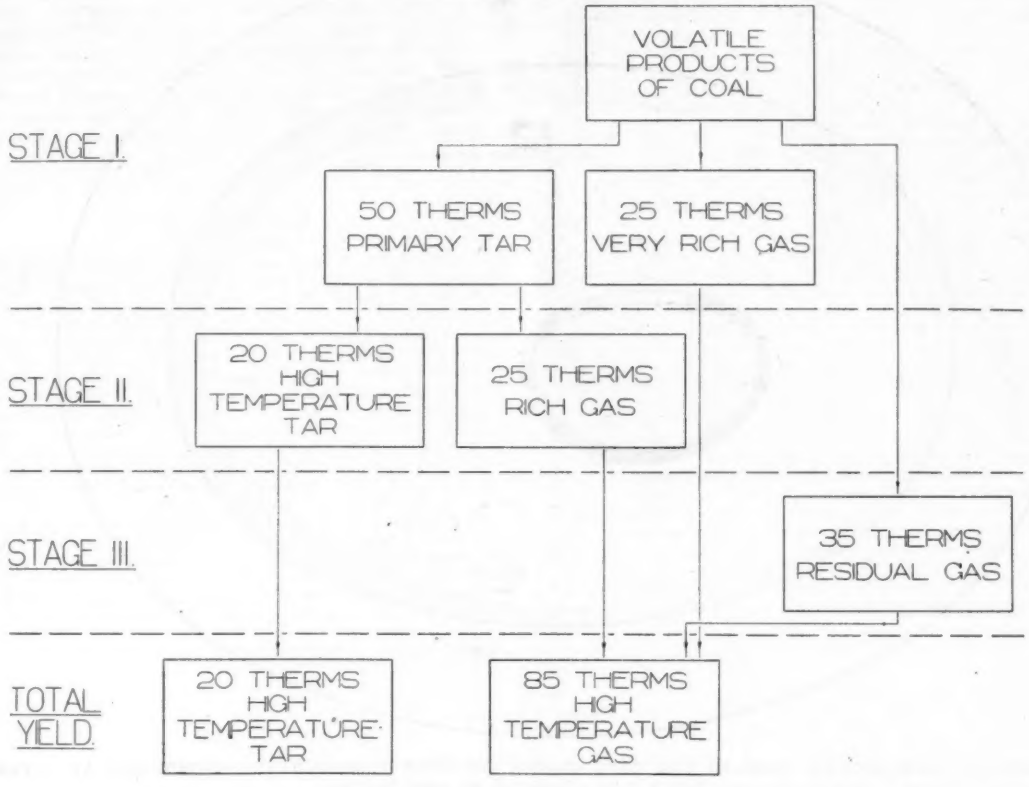


TABLE II.



mainly at the most desirable temperature. The mass of coal is finally raised to the temperature of 1000° C., in order to expel the 35 therms of residual gas which is unaccompanied oily vapours requiring to be decomposed.

In passing, it may be of interest to refer to the method we adopt for ascertaining these temperatures; for if they were determined by the usual methods of pyrometry, an immense amount of work would be involved. In studying the question of the volatile matter of coke and the therms of residual gas which remain in the material after normal high-temperature carbonization, it was found that the degree to which the coke reacted with concentrated sulphuric acid heated to a definite temperature was dependent on the amount of residual gas remaining in it. A test was therefore devised by which it was possible to measure the rate of the evolution of sulphur dioxide resulting from a known weight of coke when immersed in a definite quantity of heated sulphuric acid. This rate of evolution we refer to as the *chemical reactivity* of the coke; and we subsequently discovered that this chemical reactivity was definitely related to the final temperature to which the coke had been subjected in the carbonizing process. By carrying out a large number of tests upon coke heated to known temperatures, the method was accepted as one which would give a fair indication of end temperatures. By this test, which must be regarded as one of rough approximation, it is possible to take sections from the retort charge at different periods in the carbonizing process, and to trace the temperatures to which the material has been heated. The accompanying diagram shows the temperatures which had been reached in a section of a coal charge which was removed from the retort at a period when the operation of cracking was proceeding.

Free Carbon.

In the foregoing statements, little reference has been made to free carbon, which is a most important factor in the carbonizing process. Free carbon is invariably produced in the cracking of primary and low-temperature tars; but whether it shall be carried over with the gas and tar and found eventually by the tar distiller, whether it shall be found as retort carbon adhering to the sides of the retorts, or whether as free carbon deposited in the mass of coal undergoing carbonization, and found eventually in the remaining coke, depends upon the extent to which cracking has taken place in the mass of heated coal as distinct from cracking in the free space of the retort. It is well known that the tar produced from partly filled retorts contains high percentages of free carbon; and the advantages of the heavy charge lie not only in the greater ease of controlling the cracking temperature, but also in the fact that as the cracking takes place mainly within the mass of coal undergoing carbonization the free carbon produced is deposited therein. The coke resulting, therefore, from a well-filled high-temperature horizontal retort will consist of true carbon residue, *plus* about 15 therms of carbon per ton of coal carbonized (about 100 lbs.) resulting from the decomposition of volatile substances.

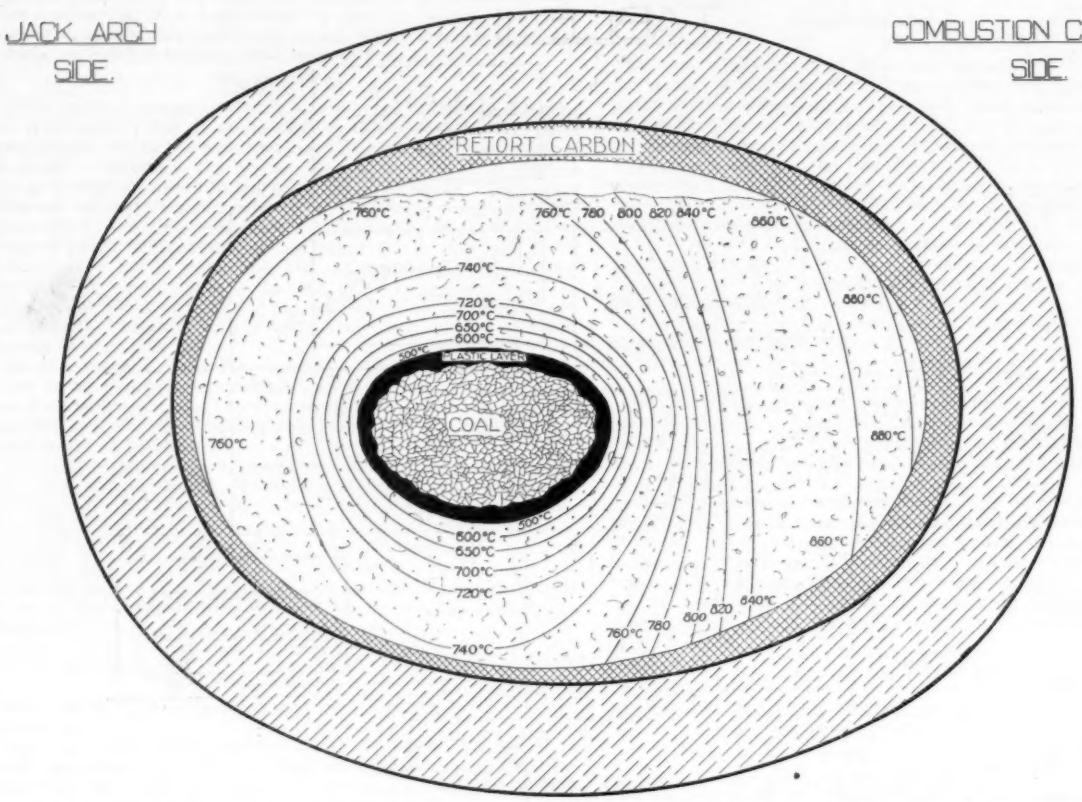
The importance of free carbon must always be taken into account when applying the thermal conception of the carbonizing process. The failure to appreciate the part played by free carbon in the American volatile matter test of coal may lead to erroneous conclusions. For example, a technical man, when evaluating coals for carbonizing purposes, might reason that the difference between the calorific value of the coal subjected to the test and the calorific value of the remaining coke should be the calorific value of the volatile products. Further, if these volatile products are resolved into tar and gas during the carbonizing process, then their equivalent should be recovered as tar and gas therms. But this is not the case, for the test normally applied to determine the volatile mattter in the coal does not give a true indication of the yield of serviceable volatile products which will be obtained on large-scale working. This is due to the fact that in the laboratory test the weighed coal is heated so rapidly that the free carbon is driven off as well as the volatile matter.

I think it will now be conceded by you that variations in the distribution of the total therms between the gas, tar, and coke can be explained if they be regarded as due to the cracking of the primary tar under varying conditions of temperature and time of contact.

Influence of Hydrogen on Cracking Processes.

You may inquire whether the interpretation which has been drawn above in a general way only, serves any useful purpose. The answer to such a question would be that we have been able, as a result of the knowledge of the conditions best suited to efficient carbonization, materially to improve our own practical results, and the chemists controlling the process are working less in the dark than formerly.

For the purpose of developing the main point of this lecture—which is to demonstrate the almost supernatural vision of the man to whose memory it is delivered, it is necessary to proceed to a further stage with this picture of carbonization. It will have been noticed that although our work of investigation into the principles underlying the destructive distillation of coal has been carried out with the care normally associated with laboratory observations, yet the yield of products does not constitute a material improvement on those being obtained to-day in the practice of high and low temperature carbonization. We have observed one fact of the utmost importance—if a sufficiently high proportion of hydrogen is present in the gas during the cracking operation, the calorific value of the gas produced from the coal is materially higher than that of the gas normally obtained on large-scale working. In other words, the thermal yields are similar, but the gas produced is higher in calorific



DIAGRAMMATIC CROSS-SECTION THROUGH THE COAL CHARGE, SHOWING TEMPERATURE DISTRIBUTION AT A PERIOD WHEN TAR CRACKING IS PROCEEDING.

value. This means that with more carefully controlled cracking of hydrocarbons, the degree of dilution by means of steaming the charge or by the addition of water gas is greater for the attainment of the same end calorific value. We have found that if a specific concentration of hydrogen is maintained when the primary and low-temperature tars are undergoing decomposition, a definite degree of hydrogenation takes place. It may be, perhaps, an exaggeration to term the process one of hydrogenation, for the maintenance of these conditions may have the effect simply of directing the nature of the decomposition; but it is a fact that the distillation of coal under these conditions results in the production of a larger proportion of hydrocarbons, with a corresponding reduction in the amount of hydrogen.

By the application of this principle, it is found that coal may be distilled at low temperatures, and if the resulting tar is cracked in its nascent state (at a temperature of about 800° C.), and with the maintenance of a hydrogen atmosphere of definite concentration, it will yield the normal amount of high-temperature tar, together with 57 therms of rich gas. If the hydrogen be supplied in the form of water gas and 25 therms of this gas be used, there will result 83 therms of gas of about 560 B.Th.U. calorific value; or if 40 therms of water gas be added, there will result 97 therms of gas of 500 B.Th.U. These yields, it should be noted, are on the basis of coal as carbonized. On the dry, ash-free basis they become respectively 91 therms of gas of 560 B.Th.U. calorific value and 106 therms of gas of 500 B.Th.U calorific value. It will be realized that the solid product remaining will be a true low-temperature coke. It is conceivable that the application of this principle may materially affect the future of low-temperature carbonization—particularly in its relation to the gas industry. The main disability of the process lies in the fact that the carbon monoxide content of the gas would be materially greater than that of the gas produced in the carbonization of coal in the horizontal retort. It would not, however, be greater than that supplied by many undertakings in the country.

Another interesting modification of a process based on these observations is one in which two-stage treatment of coal is practised. The coal is first heated to 500°-600° C., and the tar cracked in its nascent state at a temperature of 800° C. in a hydrogen atmosphere of definite concentration; the hydrogen being supplied partly as residual gas produced by heating the charge finally to 1000° C., and partly as water gas which may be produced by steaming the charge. It is found possible experimentally to produce under these conditions:

Per Ton of Coal as Carbonized.

85 therms of 560 B.Th.U. gas using 10 therms of water gas.
93 ,, ,, 525 ,, ,, ,, 18 ,, ,, ,,
100 ,, ,, 500 ,, ,, ,, 25 ,, ,, ,,

It may be thought that these principles would be utilized when steaming is carried out during the carbonization of coal in vertical retorts; but since an accurate control of the temperature and hydrogen concentration is impossible in such a process, and cracking takes place to a large extent in the hot coke out of contact with the hydrogen rich gases, it is not surprising that the results do not reflect to any appreciable extent the effects which might otherwise have been anticipated.

Finally, this picture of the carbonization process would be incomplete unless reference were made to the fact that it is possible to convert low-temperature tar into high-temperature tar by conducting it before condensation over a contact material heated to 750°-800° C.; but the process is facilitated, and the yields are more satisfactory, provided a definite concentration of hydrogen is maintained during the reaction.

CONCLUSION.

I would now refer you to an extract from a paper published by William Young, which appeared in the "JOURNAL OF GAS LIGHTING" of August, 1882:

> "The suggestion then is, first subject our coal to a preliminary destructive distillation by means of the exhaust or waste heat from the decomposing retorts. By so doing, the whole of the volatile hydrogen of the coal would be fully saturated with carbon and the volatile products be of comparatively uniform composition. Then pass the products of this stage of the distillation through a second series of decomposing vessels, kept at a carefully regulated temperature, so as to decompose these products to the state desired; the resulting products being subjected to after-treatment in the usual manner of gas manufacture."

From this it will be seen that as long as 46 years ago William Young predicted in a nebulous way the principles underlying the carbonization of coal, and, indeed, he partly described one of the processes which has been evolved as a result of considerable laboratory investigation. Although not understanding the importance of hydrogen, it is certain that he could foresee improvements in the carbonizing process as a result of controlling the conditions under which the cracking of hydrocarbons occurs.

In conclusion, I should like it to be understood that on the present occasion I have not sought to place before you results of investigations carried out in the laboratories of the Company which I have the honour to serve. Had this been the object, the lecture would have been much longer, more tedious, and a good deal more technical. Rather have I selected from our note-books one phase of the picture of the carbonization process, with the sole object of depicting the similarity between the ideas of William Young accumulated in his own inimitable way and those of to-day, when scientific method has been de-

finitely established in the gas industry. Young's methods of investigation were necessarily different; for trained chemists are now available, and in such number that it is possible to study our problems from many aspects. Advancement in knowledge is now the result of the combined effort of a body of investigators, and no longer does one individual lay claim to particular discoveries regarding the carbonization process.

I beg to tender my thanks to the President and Directors of the South Metropolitan Gas Company for allowing me to present results relevant to this Lecture which have been accumulated as a natural sequence to the policy adopted by them.

VOTE OF THANKS.

The PRESIDENT said he gathered from their hearty applause that the members thoroughly enjoyed and greatly appreciated the interesting lecture which Mr. Evans had given. He would ask Mr. David Fulton to propose a formal vote of thanks.

Mr. FULTON remarked that when it was discovered about two weeks ago that Dr. Carpenter could not come to Edinburgh to deliver the William Young Memorial Lecture, they were greatly relieved to hear that his colleague, Mr. Evans, would undertake the task. On their experience of the lecture and the lecturer that day they could congratulate themselves. It was an easy matter for men possessed of a little superficial fluency to write a lecture in the course of two weeks; but it was not every man who could write a good lecture in two weeks. Mr. Evans, he was bound to admit, had given them a lecture of exceptional quality. He was a scientist who combined a practical mind with scientific training. In the Company with which Mr. Evans was associated there had been, and there would continue to be, great achievements. That seemed to be inevitable when the Company had such an able management. The purpose of the William Young Memorial Lecture, he thought they were all agreed, was to instruct, to educate, and even to excite a desire to pursue and increase knowledge. The lecture to which they had just listened thoroughly filled these requirements. In selecting this subject of carbonization, Mr. Evans could not have chosen any theme of greater interest to gas engineers, because wherever the latter met in twos, threes, or fours, it was not long before they were discussing the results from the retort houses. The whole kernel of a gas undertaking was the retort house; and so they did well to concentrate on the work which was carried out there. There was one point he would like to mention—the delivery of the lecture. It was delivered in such a way that they could not help feeling there was a personality and an individuality about the man who was responsible for it.

Mr. JOHN WILSON (Motherwell and Wishaw), in seconding the vote of thanks, said the Council were extremely disappointed when they learned that Dr. Carpenter was not to be with them in the capacity of the William Young Memorial Lecturer. There had not, however, been foisted on them anything in the nature of a stop-gap. As a matter of fact, he might say that two or three years ago they tried to get Mr. Evans to give them a William Young Memorial Lecture; but he could not accept the invitation. The pleasure of hearing him, however, had only been delayed.

Mr. EVANS said it was very gracious of Mr. Fulton and Mr. Wilson to speak so eloquently of the Lecture. He had indeed enjoyed paying a tribute to a noble Scotsman. Particularly as he was a Scotsman who had done noble and wonderful work in his own country. All along he (Mr. Evans) had the feeling that in coming to deliver the William Young Memorial Lecture he had fallen into what might be called fortuitous notoriety, but Mr. John Wilson had reminded him that he had been asked on a previous occasion to give this lecture. Unfortunately he was obliged to refuse the invitation on that occasion, so that in the present circumstances the notoriety was not quite so fortuitous as he had imagined it to be. He was not at all satisfied with the lecture. It had contained a number of fundamental principles which ought not to be placed before them in that brutal way. These principles, however, should be verified by experiments and experimental results. His statements were none the less true, and if time had permitted he could have given them the experimental results leading to these conclusions. It was good of them, however, to have listened to him, and he was grateful for their vote of thanks.

QUALITY.

By GEORGE BRAIDWOOD, of Coatbridge.

[Before the North British Association of Gas Managers in Edinburgh, Thursday, Sept. 6, 1928.]

When asked by Mr. H. H. Gracie to read a paper in Edinburgh before this Association, and at a loss to think of a suitable subject, I somehow thought of a verse by our national poet Robert Burns which reads:

> "That I for puir auld Scotland's sake,
> Some usefu' plan or buik could make,
> Or sing a sang at least."

The meaning contained in these lines is, and always has been, obvious to Scotsmen; and while I cannot "sing a sang" or "write a buik," I thought—having at heart the best interests of one of Scotland's industries, namely that of "Gas"—I might tell of some "usefu' plan" for improving the quality of one of its products.

That the future success of the Scottish gas industry is bound-up in the word "Quality," is recognized, I think, by all—quality, in not one, but in all of its products. The subject of quality in relation to all the products of the Scottish gas industry is one much too large and important to be dealt with in one paper, so with your permission I propose to confine myself to one subject—namely, the quality of sulphate of ammonia.

SYNTHETIC SULPHATE OF AMMONIA.

Faced with an ever-increasing output of synthetic sulphate of ammonia of well-nigh perfect analysis and physical condition, it is becoming increasingly obvious that as time goes on it will be more difficult to find a market for ordinary quality salt or salt not properly dried and handled In connection with the manufacture of synthetic sulphate, a most interesting and valuable description of the plant and process employed at the Billingham Works of the Imperial Chemical Industries, written by Mr. K. Gordon, B.A., and read before the Midland Section of the Coke Oven Managers' Association, appeared in the Technical Press of April 7 last.

A sample* of synthetic sulphate which is shown may be of interest. It is almost pure white, and has an analysis well above that required by the guaranteed figures of the British Sulphate of Ammonia Federation.

SCOTTISH SULPHATE: QUALITY AND PRODUCTION.

The monthly production of sulphate from Scottish gas-works has improved enormously within the last few years, as is demonstrated by the samples shown. What the standard of quality should be has not been laid down by the British Sulphate of Ammonia Federation, but the following is an analysis which might be striven for:

Nitrogen	21·14 p.ct.
Moisture	0·04 ,,
Free acid	*Nil*

The material to be friable and of good colour.

The monthly production of sulphate from Scottish gas-works may be taken as approximately 1200 tons. Of this quantity 1000 tons are of neutral, while 200 tons are of ordinary, quality. The following are analyses of representative makes of Scottish gas-works neutral sulphate:

Nitrogen.	Moisture.	Free Acid.
21·14	0·04	*Nil*
21·14	0·10	,,
21·13	0·07	,,
21·08	0·33	,,
21·10	0·20	,,
21·14	0·19	,,
Av. 21·121	0·155	*Nil*

The material is of fairly good colour and of excellent physical condition, as the samples show.

At this point it is of interest to note how these figures compare with neutral salt made on Scottish coke-oven plants and oil works. Coke-oven plants average:

Nitrogen	21·128 p.ct.
Moisture	0·126 ,,
Free acid	*Nil*

Oil works average:

Nitrogen	21·136 p.ct.
Moisture	0·133 ,,
Free acid	*Nil*

of a yellowish colour but good condition.

The analysis of ordinary salt made in Scottish gas-works averages:

Nitrogen	20·832 p.ct.
Moisture	1·207 ,,
Free acid	0·266 ,,

The percentage of ordinary salt made in the Scottish gas-works compared with neutral is 16·8 p.ct., while in coke-oven plants and oil works the percentage is 8·05.

SELLING PRICE.

That the very highest quality of neutral dry sulphate of ammonia is, and can be, made in Scottish gas-works, there can be no doubt; but opinions differ as to whether the extra trouble and expense in neutralizing and drying the salt is sufficiently compensated for in the extra selling price, or whether it even

* An interesting series of products was exhibited by Mr. Braidwood. It included Coatbridge salt as leaving dryers, as normally supplied, as desired by the foreign buyer, and samples of the synthetic sulphate.

pays to make any quality of sulphate of ammonia. However, before attempting to treat of the financial aspect of the case, I propose to deal with improving the quality of the salt in order to obtain the highest possible selling price.

A study of the analysis shown in the list of ordinary quality sulphate shows the average moisture content to be 1·207 p.ct., while the average free acid is 0·266 p.ct. The nitrogen average of 20·832 p.ct. is well above the figure of 20·6 p.ct. guaranteed by the British Sulphate of Ammonia Federation for neutral quality salt. It would appear therefore that the chief problem to be tackled by the Scottish gas-works ordinary quality sulphate makers is that of drying.

DRYING SULPHATE OF AMMONIA.

In order to apply with success any method of drying, attention must be given to the principles underlying heat transference. During the months of summer, sulphate of ammonia may be dried after a fashion in the store by exposure to the atmosphere; but during the winter, when the atmosphere reaches at times well over 90 p.ct. relative humidity, the use of artificial heat becomes a necessity. During the four months March-June of this year the relative humidity as tested in the Coatbridge Gas-Works was 77·9 p.ct. The calculation being as follows:

Average, dry bulb	53·0° Fahr.
,, wet bulb	49·5° ,,
Difference	= 3·5° dryness.
Absolute dryness of atmosphere	8·166

Dew point = temp. of air − absolute dryness—*i.e.*, 53° − 8·166°
= 44·834°
= say 45° Fahr., dew point

$$\text{Quantity of vapour in 1 c.ft. air} = \frac{3{\cdot}893}{1{\cdot}0167} = 3{\cdot}829 \text{ grains existing}$$

Grains required for saturation at 53° Fahr. = 5·003 − 3·829 = 1·174 grains

$$\text{Relative humidity} = \frac{3{\cdot}893}{5{\cdot}003} = 0{\cdot}779 \times 100 = 77{\cdot}9 \text{ p.ct.}$$

While the calculations involved in arriving at the air volume and temperatures required for drying are known to you, it may be of interest to show how they were applied in the circumstances peculiar to Coatbridge.

Assuming 5 tons of sulphate containing 5 p.ct. moisture had to be dealt with daily:

5 tons at 5 p.ct. moisture content = 0·25 ton to be evaporated.

Temperature aimed at	= 75° Fahr.
Outside air temperature	= 40° ,,
Water content of saturated air at 40° per c.ft.	= 0·00041 lb.
Expanded to 75° content is	0·00038 ,,
Air at 75° can contain maximum	0·00135 ,,

But 80 p.ct. relative humidity can only be expected.

Therefore 0·00135 × (0·8 − 0·00038) = 0·0007 lb. H_2O per c.ft.

The number of cubic feet necessary to absorb 0·25 ton moisture is therefore—

$$0{\cdot}25 \times \frac{2240}{0{\cdot}0007} = 0{\cdot}8 \times 1{,}000{,}000 \text{ at 75° Fahr., or}$$

$$0{\cdot}25 \times \frac{2240}{0{\cdot}00075} = 746{,}666 \text{ c.ft.} \times 0{\cdot}0792 = 59{,}136 \text{ lbs. of air at 40° Fahr.}$$

Specific heat of the wet sulphate, say	= 0·35
Temperature heat of the wet sulphate, say	= 40° Fahr.
Latent heat of H_2O at 75° Fahr.	= 1030 B.Th.U. per lb.

The number of B.Th.U. required may be found as follows—

	B.Th.U.
Heating the sulphate 0·25 × 2240 × 0·35 × 35	= 6,860
Water vaporization 0·25 × 2240 × 1030	= 576,800
Heating the air 59,136 × 0·24 × 35	= 496,742
Loss, say about 10 p.ct.	= 109,598
Heat required	= 1,190,000

Thus 1,190,000 B.Th.U. must be given to the 59,136 lbs. of air, which must be raised to a temperature x, found thus:

$$59{,}136 \times 0{\cdot}24 \times (x - 40) = 1{,}190{,}000$$
Temperature required x = 123° Fahr.

The 59,136 lbs. of air containing 1,190,000 B.Th.U. should thus enter the chamber at 123° Fahr. and leave at 75° Fahr.

DRYING CHAMBERS.

Having established the fact that to dry 5 tons of salt containing 5 p.ct. moisture effectively 1,190,000 B.Th.U. of heat in 59,136 lbs. of air at 123° Fahr. must be used, the question arose as to how the hot air was to be obtained and applied.

To raise the temperature of the atmosphere in the sulphate works to 123° Fahr. was out of the question; and so, as for reasons of economy it was not thought desirable to use mechanical methods of drying, some form of closed chamber suggested itself. Having decided on the closed chamber, the next question to be settled was the source from which the heat was to be obtained. To raise the temperature of the air by means of a coke or breeze furnace was economically unsound, and would of course have been reflected in the manufacturing cost of the sulphate. So attention was given to the question of utilizing the surplus heat in the exhaust steam from the exhauster engines and pumps.

First it was required to calculate the amount or weight of steam to give the necessary heat—namely, 1,190,000 B.Th.U.

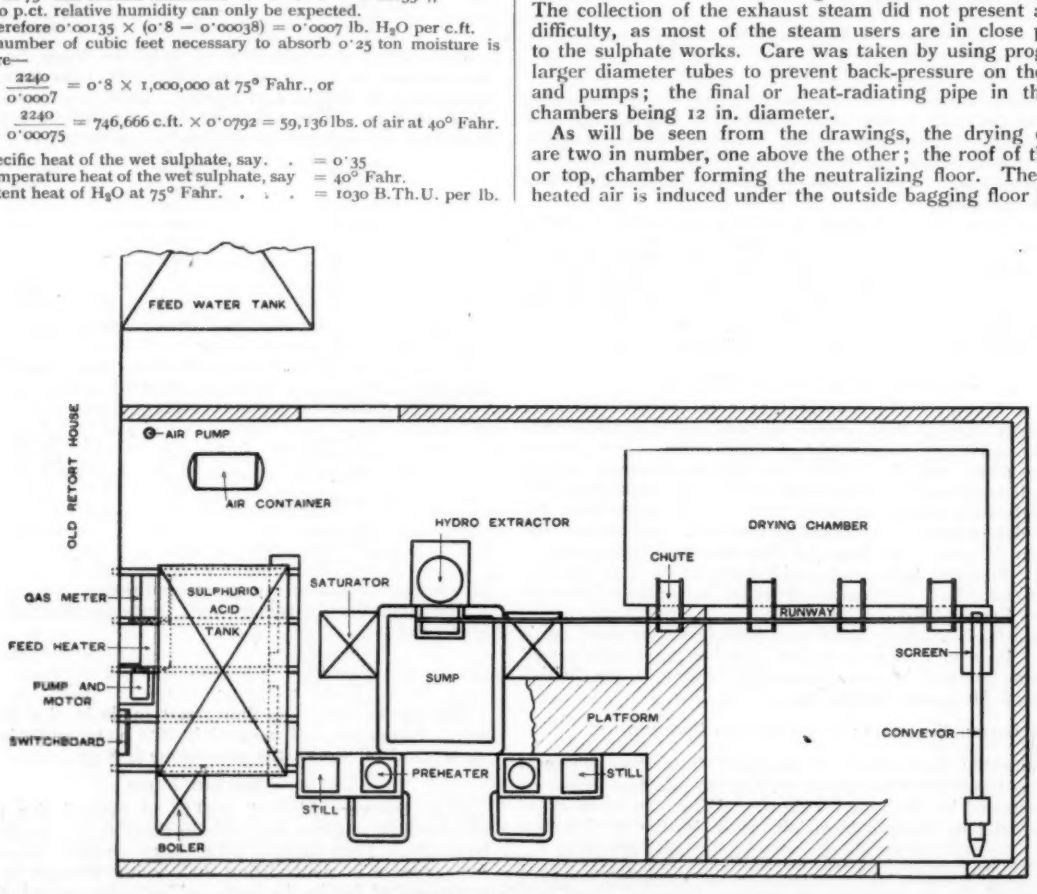
Heat Transfer.

Assuming that the exhaust steam had a total heat of 1155 B.Th.U. per lb.
And that its total heat as condensed water at 75° Fahr. was 43 B.Th.U. per lb.
And that the heat transfer from steam to air was accomplished with an efficiency of 75 p.ct.
Then the weight of steam required would equal—

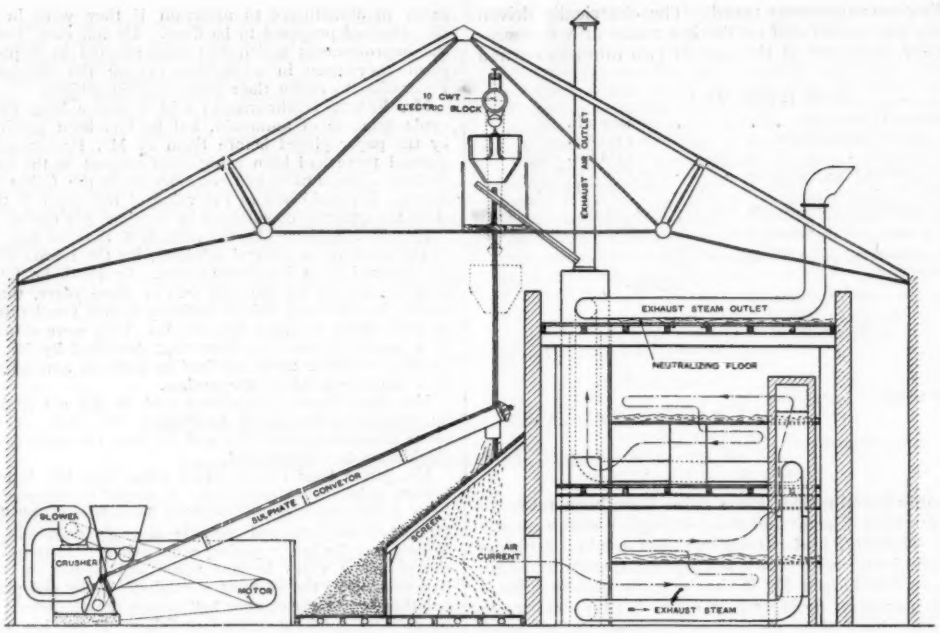
$$\frac{1{,}190{,}000 \text{ B.Th.U.}}{1112 \times 0{\cdot}75} = 1427 \text{ lbs.}$$

Having arrived at these theoretical conclusions, their application proved of interest and satisfaction. Knowing the weight of water evaporated at the boilers and the weight of exhaust steam used to raise the purifier temperature and preheat the boiler feed water, there was no question of having sufficient surplus heat available in the remaining exhaust steam for the purpose. The collection of the exhaust steam did not present any great difficulty, as most of the steam users are in close proximity to the sulphate works. Care was taken by using progressively larger diameter tubes to prevent back-pressure on the engines and pumps; the final or heat-radiating pipe in the drying chambers being 12 in. diameter.

As will be seen from the drawings, the drying chambers are two in number, one above the other; the roof of the upper, or top, chamber forming the neutralizing floor. The partially heated air is induced under the outside bagging floor (which is



PLAN OF SULPHATE PLANT.



PART ELEVATION OF SULPHATE PLANT.

heated by closed exhaust steam coils underneath) and rises as it passes through the chambers to its highest temperature in the outlet chimney. The arrangement of bringing the exhaust steam pipe into the chambers by way of the outlet chimney had the desired effect of maintaining the highest temperature at this point and so inducing a strong current of air through the chambers.

Before reaching the drying chambers the sulphate is ejected by air from the saturator on to the draining table; from there it falls into a 48-in. steam under-driven centrifugal drying machine. Here the salt is washed with hot water and whizzed to recover the surplus mother-liquor necessary to maintain the saturator level. From the centrifugal machine the material is elevated in a receptacle by an electrically operated block on to, and along, an overhead runway to the chutes leading down to the neutralizing floor.

On this floor, which measures 25 ft. by 15 ft., and over which the temperature averages 70·5° Fahr., the sulphate is mixed with the necessary amount of ammonium carbonate for its neutralization, turned over, and dropped through openings into the first enclosed drying chamber. Here it is subjected to a temperature of 123° Fahr. Thence it passes down into the second chamber, where it gives up the last of its moisture at a temperature of 120° Fahr.

By the time the salt reaches this stage it is thoroughly dry, but in a lumpy condition (as shown by the sample) owing to the cementing action of the mother-liquor. The dried material is finally crushed, elevated, and screened into the finished salt store, which is at a temperature of 75° Fahr. The arrangement of the crusher and work elevator is shown in diagrammatic form.

Sample marked No. 1 shows the salt as it leaves the drying chamber, while No. 2 is a sample of the finished material. The finished product has an analysis of—

Nitrogen	21·16 p.ct.
Moisture	0·02 ,,
Free acid	*Nil*

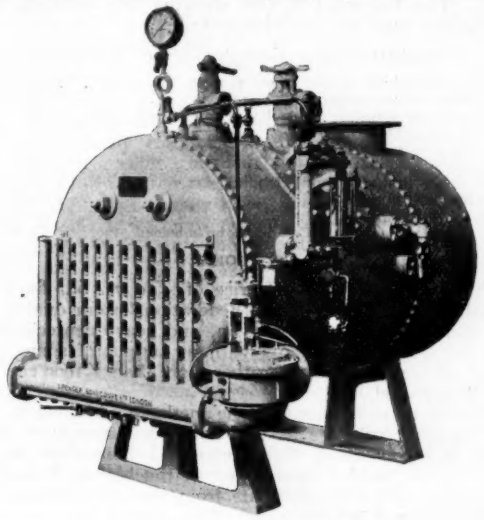
of excellent condition but rather grey in colour.

Steam Raising Plant.

On transferring the sulphate works to its new site, it was considered an opportune time to arrive at the exact amount of steam necessary to operate the plant. With this object in view, a Town Gas (Bonecourt), Ltd., Company's boiler of a suitable size was installed. This boiler is what is known as a 6.B. type suitable for a working pressure of 120 lbs. per sq. in., fitted complete with automatic gas and water control devices—special attention being paid to the feed-water supply arrangements. Owing to the condensation losses common to steam-driven feed pumps operating intermittently, it was decided to use a three-throw ram pump coupled direct to an electric motor. These automatic arrangements have proved excellent, and the boiler installation requires no attendance, except for an occasional look by the sulphate maker at the control lamp placed adjacent to the operating platform.

The water to the boiler is measured by meter, and preheated by exhaust steam to a temperature of 180° Fahr., while the gaseous fuel (of 475 B.Th.U. per c.ft. gross) is measured by a cylindrical wet meter. A Boys calorimeter is used to arrive at the calorific value of the gas. The rated capacity of the boiler is 1400 lbs. of steam per hour from and at 212° Fahr. with natural draught.

It was the intention to instal a boiler capable of supplying the steam necessary to operate only one of the 2 ton per day sulphate stills when working at full load; the amount of steam necessary being given by the makers of the still as a minimum of 32,000 lbs. per day. In practice the actual figure was found to be 31,680 lbs. per day. It will be observed from the above figures that the total steaming capacity of the 6.B. Bonecourt



The Type of Boiler Installed.

boiler was 1400 lbs of steam from and at 212° Fahr., or 33,600 lbs. per day, so that the steam requirements of the 2-ton still put a load on the boiler which caused it to steam at practically its full capacity, thus proving in practice an excellent check on its rated capacity.

Capacity of Gas-Fired Boiler.

The result of the boiler test proved very satisfactory indeed. The boiler actually evaporated over a period of three weeks 131·0 gallons of water per hour having a temperature of 180° Fahr. at a steam pressure of 73·5 lbs. per sq. in.

These average figures work out at almost exactly the figure of 1400 lbs. steam per hour from and at 212° Fahr. as given by the makers of the boiler, thus:

$$\text{Equivalent evaporation from and at 212° Fahr.} = \frac{\text{1310 lbs. } H_2O \times \text{1189 B.Th.U. per lb.} - (180° \text{ Fahr.} - 32° \text{ Fahr.})}{\text{970 B.Th.U. per lb.}}$$

$$= \frac{1310 \times 1189 - 148}{970}$$

$$= \frac{131 \times 1041}{97}$$

$$= 140{\cdot}5 \text{ gallons}$$

$$= 1405 \text{ lbs. steam}$$

At no time while the boiler was steaming at full load were

the water-feeding arrangements taxed. The electrically driven three-throw ram pump operated on the hot water at a temperature of 180° Fahr. perfectly at the rate of two minutes on and one off.

Three Weeks' Test.

Gas consumed per hour	= 3400 c.ft.
Water evaporated per hour	= 1310 lbs.
Gauge pressure	= 73·5 lbs.
Temperature of feed water	= 180° Fahr.
C.V. of Gas	= 475 B.Th.U.

$$\frac{\text{Lbs. evaporated per c.ft. gas} \times \text{heat added per lb.}}{\text{C.V. of gas}} =$$

$$\text{Lbs. evaporated per c.ft. of gas} = \frac{1310}{3400} = 0{\cdot}385 \text{ lbs.}$$

Heat added per lb. water =
Total heat, B.Th.U. per lb. −
(temperature of feed water − 32°)
= 1189 − (180° − 32°)
= 1189 − 148
= 1041 B.Th.U.

Heat added to 0·385 lbs. water
= 1041 × 0·385 B.Th.U.

$$\text{P.ct. efficiency} = \frac{1041 \times 0{\cdot}385 \times 100}{475} = 84{\cdot}37$$

As will probably be admitted, some pains have been taken to produce a salt which meets the most stringent requirements as to dryness, friability, and neutrality; but having achieved that object, we find that with a salt having a 0·02 p.ct. moisture content, no more can be got for it than can be obtained for a salt containing 0·25 p.ct. moisture, or over 10 times as much. Again, with an analysis of 21·16 p.ct. nitrogen we get no benefit from the extra 0·06 p.ct.; the Federation only paying on the full 0·1 p.ct., or 21·1 p.ct. nitrogen. In short we give away for nothing 0·23 p.ct. in weight and 0·06 p.ct. in nitrogen. It cannot be believed that by these methods the British Sulphate of Ammonia Federation will encourage makers to do their best to produce and retain the market for the very best quality of salt.

While it is clear that it does not yet pay to make sulphate having an analysis of 21·16 p.ct. nitrogen and 0·02 p.ct. moisture when 21·1 p.ct. nitrogen and 0·25 p.ct moisture will bring the same reward, it does not follow that sulphate of ammonia making does not pay at all, as certain people would make believe. The following figures showing the working costs at Coatbridge may prove of interest:

Sulphate Making Costs per Ton of Neutral Salt.

Acid required, 19 cwt. at 40s. per ton	£1 18 0
Fuel, 193·8 therms at 2d. per therm*	1 12 4
Boiler feed water, 1570 galls. at 1s. per 1000 galls.	0 1 7
Bags, 10 at 1s. each	0 10 0
Ammonium carbonate, at £23 per ton	0 1 9
Wages, sulphate maker	0 12 1
,, drying, bagging, loading, &c.	0 12 0
Repairs, say	0 2 3
	£5 10 0

* Cost per therm in holder.

PROFIT.

With the present selling price of £10 7s. 6d. fixed by the British Sulphate of Ammonia Federation for our quality of salt, and allowing for the interest on, and heavy depreciation common to, all sulphate plants with an output of some 350 tons of salt per year, a profit of rather more than £1000 can reasonably be expected.

While fully conscious that the methods described for drying and handling sulphate at Coatbridge will not meet with the entire approval of all the members, I hope that those who have not yet tackled the making of the highest "quality" of neutral dry salt will appreciate from this very general description how easy it is to do so.

An invitation is given now to anyone interested to visit Coatbridge, where the whole plant may be inspected.

Discussion.

The PRESIDENT said that, after listening to this splendid paper, he felt constrained to make a suggestion that, in order to give members an opportunity for fuller discussion, printed copies of the contributions should be available about a week before the meeting. He made that suggestion because Mr. Braidwood's paper was full of interesting data and a large number of calculations which it was impossible for members to follow or to check as the paper was being read. He congratulated the author on the title he had chosen. He agreed with him that "quality" was very important. It ought to be their slogan, combined with "service" and "cheapness." He thought the author had made out a good case why the British Sulphate of Ammonia Federation should pay a higher rate for such standard and quality of salt as they were producing at Coatbridge. Since the Edinburgh Corporation had put into operation their new plant at Granton—which, by the way, was open to the inspection of all those interested—they had been getting splendid results. At Granton they had been producing sulphate considerably over the prescribed maximum of nitrogen and with a lower amount of moisture. In these circumstances, they were feeling in Edinburgh very much like Mr. Braidwood at Coatbridge—that they should get a better return for the higher quality of salt. He had approached the Sulphate of Ammonia Federation on this point of a higher price for the better quality, and the answer he obtained was that the Federation had fixed the maximum after having been in communication with a good many manufacturers to ascertain if they were in agreement with the standard proposed to be fixed. He felt now, however, that with the improvements which had been effected in sulphate of ammonia plant they were in a position to ask the Sulphate of Ammonia Federation to revise their ideas on this subject.

Mr. FRAZER (Dalmarnock) said it was a long time now since he made sulphate of ammonia, but he had been particularly impressed by the paper placed before them by Mr. Braidwood in so far as it showed there had been a big improvement in the methods of manufacture. The author had certainly made the fullest use of his waste steam. It would add to the value of the paper if the author would state the quantity of sulphate he obtained per ton of coal carbonized.

Mr. DAVID VASS (Perth) remarked that he was much interested in the question of neutral sulphate, for the reason that a profit could be obtained from its manufacture. In Perth he found, after going into the figures for the past two or three years, that he was losing money in producing salt of ordinary quality; and this year they made up their minds to make neutral salt. They were obtaining it, however, in a much simpler way than that described by Mr. Braidwood, but he did not think their salt had so high an ammonia content as had that manufactured by the author.

Mr. SAM. MILNE (Aberdeen) said he did not make sulphate; but he had been privileged to inspect the plant at Coatbridge, and those interested would do well to copy the arrangement which Mr. Braidwood had introduced.

Mr. JAMES BELL (Dumbarton) asked why Mr. Milne did not manufacture sulphate of ammonia. It would be interesting if they could have a discussion on the relative financial possibilities of the manufacture of sulphate and the sale of crude ammonia to the distillers. Which was the better paying proposition? At frequent intervals over the past few years he had taken out figures on this subject. He had considered the costs of a sulphate house and plant; and his calculations up to the present had shown that he would be losing money by making sulphate instead of following out his present method of selling the crude ammonia. They had to dispose of their ammonia in some way or other.

Mr. ROBERT STURROCK (Ardrossan) remarked that he had recently dismantled his sulphate plant. In a small gas-works such as they had at Ardrossan, sulphate of ammonia plant did not pay. It cost them £12 per ton to produce the salt, and the price they received for it was about £11 per ton. It was conceivable that the proposition might be a paying one in a larger gas-works, but in works with an output of from 40 to 60 million c.ft. a year he did not think it would pay.

Mr. JOHN WILSON (Motherwell and Wishaw) said that on his works they had a sulphate plant with a saturator of similar dimensions to that at Coatbridge, and they were doing very well with it. They used to make about 45 to 46 lbs. to the ton, latterly they had fallen to 35 lbs., but now they were up again to 45 lbs.—and this, too, with an old plant. With the large saturator they were getting beautiful salt. They were obtaining 6s. per ton more for it than formerly. The question had been raised as to whether it paid a gas undertaking to manufacture sulphate. In the Motherwell and Wishaw case it did pay. If was found to pay if the works were of sufficient size and if they had been fortunate enough to have had the plant installed before sulphate of ammonia became so cheap. It might not be a paying proposition to-day if they had to buy a new plant, but it must pay in works where the expended capital had already to a large extent been written down.

Mr. THOMAS GLOVER, C.B.E. (Norwich), who was invited by the President to speak, said he had to thank them for electing him to membership of the Association, and he would do his best to attend at least one meeting in the year. He greatly admired Mr. Braidwood's paper, which gave them in more detail than they had had for a long time the cost of making sulphate of ammonia. The total costs of working in the author's case were about £5 10s.—a very low figure compared with many other works. It was to his mind a serious question whether in many of the smaller undertakings they could profitably afford to manufacture sulphate, particularly if they were to charge all the expenses that ought legitimately to be charged. What were these smaller undertakings to do with their liquor? They were forbidden to put it into the sewers, and they were forbidden to put it into streams and rivers. It must be worked up if possible, and preferably in the gas-works. The author, in his admirable paper, had shown them one of the ways in which it could be so worked up, and that was by the use of waste heat. It had been passing through his mind recently whether they should not in the end develop a better method of combining the two products from the distillation of coal. One of the drawbacks of vertical retorts—indeed the only drawback he knew of—was the weak liquor produced, but surely a solution of the question lay in the better use of waste heat. In conjunction with vertical retorts, all modern installations were fitted with waste heat boilers, and these boilers would get over the difficulty of converting the weak liquor into a concentrated liquor, or into sulphate of ammonia. In his own case the sulphate of ammonia works were 20 miles by road and 30 miles by water from the gas-works, and the high carriage for weak liquor put an end to the making of sulphate. They altered their ideas and concentrated upon liquor. In that way the loss which had been incurred in carrying weak liquor and the making of sulphate of ammonia had been overcome. At present there was a small profit on the ammonia products, as compared with the previous loss.

Mr. NISBET (Paisley) said that his undertaking made no sulphate of ammonia, but they sold ordinary liquor, which relieved them to the extent of about three farthings per 1000 c.ft.

Mr. MITCHELL (Nelson) thought the value of the paper would be enhanced if the author would give a full description of the manner in which the salt was taken from one level to the other.

The Author's Reply.

Mr. BRAIDWOOD, in replying to the discussion, said he had concentrated on the manufacture of neutral sulphate of ammonia for some time, but had gone leisurely about the process. As opportunity

presented itself, they added one bit of plant after another. They were naturally rather proud of what they had been able to accomplish. Formerly they obtained about 40 lbs. per ton, but since the introduction of the neutral sulphate plant their best had been about 36½ lbs. per ton. They had no trouble whatever in making the neutral salt or in keeping down the moisture. Mr. Bell had raised a point as to whether it was better to make sulphate of ammonia in the gas-works or send the ammonia to the distiller. He was afraid that little profit could be made from selling to the distiller. Experience in several instances had shown that the money obtained from the distiller would not pay the carriage. Mr. Bell complained that he could not get his accounts to balance in the manufacture of sulphate of ammonia. If he cared to come to Coatbridge, they would endeavour to show him how to do it. Mr. Sturrock would find from the published accounts of the Coatbridge Gas Company that they were getting £1100 profit from the neutral plant after making the usual allowances for repairs and meeting all the necessary charges. He was pleased to hear from Mr. Wilson that his new saturator was realizing expectations. Mr. Young, who was known to most of the members present, when he first saw the saturator at Coatbridge considered it was rather too big. He had since, however, admitted that he was surprised at the results they were getting from the saturator. The remarks made by Mr. Glover in regard to waste heat were most important, and it was interesting to hear that gentleman say he had solved his ammonia problems by selling his concentrated liquor. Concentrated liquor in Scotland had been tackled, but the market there was difficult to get. Mr. Nisbet had mentioned that he was relieving his costs to the extent of ¾d. per 1000 c.ft., but the Coatbridge return was better—about 1d. per 1000 c.ft. At the same time, he had to admit that 36½ lbs. per ton was a fairly large yield for neutral salt. Mr. Braidwood concluded by explaining the method of taking the salt from one level to another.

NORWEGIAN GAS-WORKS ASSOCIATION.

Twenty-Sixth Annual Meeting at Bergen, Aug. 25 to 27.

The rendezvous for the Twenty-Sixth Annual Meeting of the Gas Engineers of Norway was Bergen, the commercial capital of the western part of the country. Its population is about one hundred thousand. The town will be found to be full of interest to the British visitor; its picturesque position impresses him as the place is approached from the sea. It comes as a surprise to the man who is accustomed to the statement that "white coal" is extensively utilized in Norway for the production of electricity, to find on going ashore that the streets of Bergen are largely lit by means of gas. On seeking the reason, he learns that it is due to the ability and unceasing activity of the Gas Department of the Corporation. It has produced gas in such an economical and satisfactory manner that its application in the service of street lighting has been in vogue for some years, and continues to develop.

The original Bergen Gas-Works were designed in the fifties by the late Mr. Neumann, father of the present Engineer of the works at Tronjeim, a town on the coast many miles north. Horizontal retorts were first installed at Bergen, the mouthpieces bearing the name of Dempster. On the death of Mr. Neumann, the late Mr. Schieldrop was appointed, and from his designs new works were erected. They now consist of verticals, both Glover-Wests and Woodall-Duckhams being in successful operation, with the indefatigable Mr. John Irminger as Chief Gas Engineer to the Municipality. He followed Mr. Schieldrop, is the son of the veteran John Irminger, of Copenhagen, and much to the advantage of the township has held his position for some thirteen years.

The meeting was timed to begin at 12 o'clock on Saturday, Aug. 25, the venue being the Hotel Rosenkrantz. Here the members and invited visitors were welcomed by Mr. Irminger, acting on behalf of Mr. R. Krogh, President of the Association (Engineer of the Oslo Corporation Gas-Works), who was not able to attend. He sent a telegram expressing his regret, and best wishes for a successful meeting under the direction of his friend and colleague at Bergen. There was a good attendance of members, those present including, in addition to the Bergen Engineer, the respective Engineers of Tronjeim, Christiansand, and as far afield as distant Iceland; while representatives of countries abroad were Dr. Schutte, Hon. Mem.Inst.G.E., of Bremen, representing as its President the German Association of Gas and Water Engineers; Mr. John Irminger, M.Inst.G.E., of Bergen, as representative of The Institution of Gas Engineers; Mr. Larsen, of Aabenroa, representing as its Secretary the Danish Association of Gas Engineers and Managers; and Mr. Sandmark, Engineer of the gas undertaking at Malmo, representative of the Swedish Gas Engineers' Association. Mr. Walter T. Dunn, Secretary of The Institution of Gas Engineers, on holiday in Norway, had been invited to attend, and was present throughout the proceedings of the three days' meeting.

After a few words of welcome from the Acting-President, Mr. Irminger, and the dispatch of an appropriate telegram to the President, Mr. Krogh, the members quickly got to work.

Billing and Accounting Systems.

The first paper was by Mr. A. Hegrenaes, whose subject was "Billing and Accounting Systems for Gas Sales." In it he described the plan of operation at the Bergen Works, which had been gradually evolved by the Engineer, as experience over some years had directed. Specimens of the various forms and bill-heads were shown, reminding one somewhat of those illustrating the paper read before The Institution of Gas Engineers a year or two ago by Mr. John W. McLusky, of Glasgow. The conditions, however, at Bergen are different, and it was evident that Mr. Irminger had brought to bear much originality on the subject before the meeting.

In the office at Bergen accounting and adding machines are used for making out consumers' bills, and there is a complete system of filing. A table of tariffs showed that the prices charged range from 18 ore to 5 ore per cub.m., according to the volume of gas used. (£1 sterling at Sept. 1 was equal to 18 kroner 18·25 ore; 100 ore = 1 kroner.)

There was not much discussion on Mr. Hegrenaes' paper, having in view the fact that the members were to see on the following afternoon the actual machines and filing systems during their inspection of the gas-works.

Works Economy at Bergen.

The second paper taken was by Mr. Oluf H. Lund, who is the Works Superintendent at the Bergen Gas-Works. Its title was "Works Economy at Bergen Gas-Works during a Period of Ten Years." Statistics of a comparative character were given. The figures relating to Bergen show remarkably good results, and disclose the facts that there the cheapest gas in Norway is being sold, and that the manufacturing and distributing costs are eminently satisfactory.

Mr. Irminger, as Chief of the Gas Department, added some interesting remarks during the discussion of the paper. It transpired that the success achieved at Bergen had been arrived at through patient and vigilant supervision of every section of the manufacturing and distribution sections of his undertaking. At one time there were labour troubles, but the men concerned had been tactfully eliminated, until now harmony prevailed everywhere, and each workman and official laboured together strenuously to maintain the proud position and reputation enjoyed by the Bergen undertaking. For the operation of each section an official was now personally responsible to the Chief Engineer and Manager, who co-ordinated the whole system, and systematically kept records of the results obtained by each. These results were accessible to the respective superintendents, and so the value of their work could be easily compared and duly appreciated.

Influence of Advertising on Gas Sales.

After lunch, the meeting was resumed, and a paper, well illustrated by lantern slides, was given by Mr. Fr. Hansen, Outdoor Superintendent of the Bergen Gas-Works, on "The Influence of Advertising and Exhibiting on the Sales of Gas." On the town's advertising hoardings, in the Corporation tramcars, and in other prominent places are to be seen effective advertisements setting forth the advantages of using gas for heating, cooking, lighting, &c. Mr. Irminger has utilized his spiral gasholder at the works for this purpose. It bears the legend "Kod Med Gas; Sparer Tid og Pengen" (Cook with gas; saves time and money). This can be readily seen from a distance by passengers on steamers and by persons on other ships which come up the harbour.

Views were given of the gas exhibit at the Bergen National Exhibition, which was visited on the following day. There were illustrations of important installations of gas at restaurants, and of the domestic applications of the ever-ready servant of the busy Norwegian housewife.

Gas for Central Heating.

The last paper was one by Mr. T. Neumann, Engineer of the Gas-Works at Tronjeim, who took as his subject "Some Experiments relating to the Use of Gas for Central Heating."

In Norway central heating is a problem of great importance, as in the winter time artificial heat must be provided in all the houses. Often a coke stove is fitted in each room. This is noticeable at many of the hotels. Some of the larger are, of course, supplied with a hot-water system of piping throughout the entire building, the heat source being a coke furnace in the basement. As coal is not one of Nature's gifts to Norway, the coke manufactured at its various gas-works must be supplemented by coke imported from abroad. Newcastle-on-

Tyne ships large supplies, and Germany contributes also. It will therefore be appreciated that the gas engineers of Norway require to pay much attention to coke production.

At Bergen, in anticipation of the coming winter's demands, a good stock of coke has been accumulated. In summer time, when gas is not required so much for lighting purposes, the Norwegian engineer may even use gas to heat his retorts. The quality of the coke turned out has to be fully considered. The gas engineer, while keeping an eye on his coke sales, has also to send out gas of an appropriate calorific value, which will give satisfaction to the consumer. It will thus be seen that in Norway many questions are involved in successfully supervising a gas undertaking, and that much skill is essential on the part of the engineer. He is ever anxious that he shall, by his coke output, as far as is practicable avoid the importation to his town of more coke than may be required by the inhabitants for the heating of their dwellings. He obviously wishes to manufacture all the coke needed by them.

These considerations lead to questions of the type of carbonizing plant which will yield coke of a quality for which there will be a ready sale at remunerative prices. Bergen, as already remarked, has installed two well-known and tried-out systems of vertical retorts; and has also a little-used horizontal installation. Visitors at the works were informed that the character of the coke from the verticals leaves nothing to be desired. On emerging from the discharging orifice at the bottom of the retort, the coke is practically cool enough to take into one's hands. The percentage of moisture is very low. In both types of carbonizing plant any class of coal is treated without difficulty. This has always been the case from the date of the installation of each plant.

Mr. Neumann also used lantern slides to illustrate his paper. The apparatus on which his experiments were conducted was described, but, as Mr. Irminger pointed out in the discussion, questions regarding ventilation with such an appliance in use had to be fully considered.

The Bergen Exhibition.

Votes of thanks having been accorded the authors, the session was closed, and a move made to the Exhibition, where there was a great deal of general interest. The visitor was impressed by the great variety of articles now manufactured in Norway.

In the gas exhibit of the Bergen Municipality were noticed examples of water heating by Potterton boilers (a system evidently well known and utilized in Norway); Sugg lamps; various makes of gas fires; and other domestic gas appliances.

By invitation of the Bergen Corporation, the members and visitors were entertained at dinner in the main restaurant of the Exhibition; the President of the Council (corresponding to the title of mayor or provost here), Mr. L. Lorentzen, being in the chair. There was no toast list, but several present spoke. Included were Dr. Schutte, who expressed thanks on behalf of Germany; Mr. Larsen for Denmark; and Mr. Dunn for himself as a Britisher. Afterwards there was the opportunity of meeting the ladies of the party (Mrs. Irminger, Mrs. Schutte, and others) at the Norge Hotel, where a small dance was in progress.

The morning of the following day was devoted to a most enjoyable drive by automobile from the Hotel Rosenkrantz through some of the delightful scenery for which the environs of Bergen are famed.

Inspection of the Bergen Gas-Works.

In the afternoon those present were received by Mr. Irminger at the Bergen Gas-Works. An hour's inspection proved full of interest. An experiment to determine the relative value of British silica and Norwegian fireclay for horizontal retort furnaces was seen in progress. It was not continued long enough for a pronouncement of the results to be published, but it would appear that the Glenboig silica material is giving a very good account of itself. In regard to the plan of distribution, an auxiliary high-pressure gasholder has been erected to supply the outlying portions of the township. Vertical steam engine exhausters are in use; a waste-heat boiler in connection with the two vertical retort installations amply supplies all the steam needed on the works; and there is an electrical installation for the generation of current for working the horizontal De Brouwer charging and discharging machine, and for other purposes. Meter and burner repairing shops are provided (town lighting and extinguishing is by the pressure-wave system), and there are excellent baths and messrooms for the workmen.

After the inspection, those present were entertained at afternoon tea by Mr. and Mrs. Irminger in their house adjoining the works.

Annual Dinner.

At the Association's annual dinner Mr. Irminger, the Acting-President, was in the chair. Several toasts were proposed and responded to. The Chairman gave "The Town and Corporation of Bergen," to which reply was made by Mr. Hopp, a member of the Gas Committee.

Visit to a Power Station.

On Monday morning the power station at Fro'landsdalens, whence Bergen and other towns derive their electrical energy, was visited. Mr. Bjerke (Electrical Engineer) explained the laying out, construction, and operation of the complete station. The fall of water used is about 450 ft. Generated at a very high voltage, the current is transformed down in steps until the consumer at Bergen receives it at 220 volts. The last transforming station is at Bergen itself, and has been ingeniously brought into the Exhibition there.

Concluding Business Meeting.

The concluding business meeting was held in the Municipal Administration Building close to the power station. Mr. Irminger took the chair, and after opening the proceedings, called upon Mr. T. Neumann, of Tronjeim, to present the report of the Committee appointed by the Association to inquire into questions relating to gas tariffs.

Committee's Report on Differential Pricing.

The Committee appointed at the Association's annual meeting in 1927 for the purpose of settling the question of a basis for a more uniform price for the gas supplied by the Norwegian Gas-Works submit their suggestions:

The question of a revision of the gas tariffs has during the last few years come very much to the front, not only in this country and the neighbouring countries, but also elsewhere in Europe and practically all over the world. The reason for this is that the old unit prices have been found not to meet the requirements of an up-to-date tariff, that they have proved unsuitable in competition, and that they have not obtained for the gas-works the increased consumption which is necessary for their continued existence and development.

In this connection it must not be overlooked that the competitors, and more especially the electricity works, have for a number of years carried out a more effective price policy than the gas-works. It is only during the last couple of years that the gas-works have to some extent followed suit, but the gas-works in this country have not followed any definite policy, and this has caused delay in the development, so that there has been no real method in the whole thing. On the basis of the experience gained, and having regard to what has been done abroad in this respect, it should now be expedient to take up the tariff question for thorough discussion in order to arrive, if possible, at a basis for a more uniform price, with a view to enforcing gas prices suitable for the various classes of consumers, and thus place the gas-works in a better position for competing than hitherto. The position of the various undertakings differs greatly, but generally speaking, gas-works can, without further development and increase of capital, supply more gas than they are doing at present. An increased sale of gas would in many instances mean a correspondingly larger net profit, as the bye-products yield as much as, and frequently more than, the cost of the increased coal consumption caused by an increased production.

Domestic Consumption.

In the case of most gas undertakings, the household consumption is the dominating factor, and it is this which has more especially failed during recent years. Consequently, this large group of gas consumers should in the first place be encouraged by means of a price reduction. It has in many instances been found that a slight—and even a very substantial—reduction of the general unit tariff (cub.m. price) has not given results according to expectations. On the other hand, a rebate on increased consumption, or the basic charge and a considerably reduced consumption price, has proved to be more expedient. The position is that a large percentage of gas customers give the works a direct loss. Their consumption is so small that it does not cover the expenses for reading of meters, control, and maintenance and amortization of meters. In consequence of this, the works' other consumers of gas have to pay a higher price than they would otherwise have to do. It seems, therefore, reasonable that every consumer connected to the mains should pay a minimum charge corresponding to the said expenses.

Wherever the tariff question has been up for discussion, it has nearly always been unanimously agreed that the price of gas for household consumption should be subject to a reduction for increased consumption, but at the same time it has also been suggested that there should be special prices for gas for various household uses. For instance, one price for cooking, another price for hot-water heating, and a third price for heating of rooms, &c.

On examining the tariff questions discussed in foreign gas technical journals, it will be found that such a large number of different tariffs and opinions on this point have been put forward that the matter is almost overwhelming. For this reason the Committee does not find it possible to put forward any special tariff, but must confine itself to emphasizing the main points on which the tariffs are now based. One may chiefly differentiate between the following tariff forms: (1) The unit price hitherto generally applied. (2) The basic charge with low consumption price. (3) Rebate tariff. (4) A combination of the two latter.

The Committee, in confining itself to referring to what has been stated about unit prices (1), states hereunder the points which it considers are the main features in connection with the

three other tariff forms. (2) The basic charge should generally speaking cover all fixed expenses which are independent of the amount of gas produced. At the same time, in fixing the basic charge, care must be taken to see that too large a number of the consumers do not have to pay more for the gas, when the basic charge tariff is introduced, than they would have to do if the unit price were maintained—in other words, in fixing the basic charge, the small consumers should to some extent be considered, even if by so doing this would mean a deviation from the principle that the basic charge is to cover all fixed expenses in connection with the supply of gas. It may be fixed alike for all gas consumers or groups of such, or it may be a sliding-scale for the various classes of consumer, so that the fixed expenses are apportioned differently for the various consumers of gas.

Such apportionment of the basic charge has been tried on the basis of the size of the gas meter, the dimension of the branch pipe, the number of rooms, floor area, number of family members, &c. Several of these attempts have, however, proved unsuccessful. The tariff becomes too complicated. The consumers frequently cannot follow the tariff, and the works expenses for control and bookkeeping increase out of proportion, and at the same time it is unfortunate to have too many disputes between the gas-works and the consumers.

The main thing for a tariff to answer the purpose is that it is simple, easily comprehensible, and that it acts justly, and that at the same time it makes the consumer readily see the advantages.

The Rebate System.

Rebate tariffs may be arranged on a sliding-scale so that a lower price is charged in excess of a certain consumption, a still lower price for excess of a further fixed consumption, and so on. Or the rebate may apply to the whole consumption when this exceeds a certain minimum. It may also be arranged so that it applies to the individual consumer—*i.e.*, that a rebate is allowed for that part of the consumer's consumption which is, for instance, in excess of his consumption the previous year. At the same time, the rebate tariff will in several cases prove stiff, and it lacks to some extent the inducement to increased consumption which the basic charge tariff possesses through its low consumption price. This is at once evident to the consumer; while the rebate only tends to increase the consumption at every settlement.

But, as above mentioned, the basic charge tariff may cause a direct increase in the price to the small consumers, which is, of course, not the case with the rebate tariff. In any event, if the basic charge tariff is introduced, the consumer should have the opportunity of choosing between the basic charge tariff and the unit price tariff, though in such case there should be a minimum charge.

Meter Rent.

Meter rent is generally unpopular with the consumers and the Committee considers it should be abolished as a direct charge, and should instead be included in the tariff prices.

Before an attempt is made to increase the consumption by means of tariff alterations, it is necessary to ascertain clearly to what extent the gas-works can meet such increased consumption without being compelled to extend the works, or else to ascertain what such extension will cost. Likewise it must be ascertained if such increased consumption will necessitate additional plant and labour and the cost of same.

When these and similar questions have been settled, and after the works' production price has been divided into fixed expenses and movable expenses, the question of the tariff will have to be decided on the basis of (*a*) the financial factors, (*b*) the practical factors, and (*c*) the question of equity.

In this connection it may be mentioned that there would be great difficulties for the gas undertaking in obtaining fairly reliable figures for calculating rebate tariffs, while the basic charge tariffs seem to be more suitable for making such calculation.

Industrial Rates.

As regards the supply of gas for manufacturers, the ordinary tariffs will generally not be suitable, as other fuel works out cheaper. In such cases there should be special tariffs. The position is frequently such that gas can be supplied to large consumers with advantage at a price which excludes competition. Where the bye-products bear the expense for coal and the increased working expenses, and where the works' capacity is so great that it cannot otherwise be fully utilized, every effort should be made to sell gas even at a very low price, provided the increased consumption does not increase the works' overhead charges. Altogether such special tariffs must depend upon the local conditions, and must be based entirely on business principles.

In accordance with what has been stated, the Committee considers that the question of the gas tariffs should be settled on the following bases: (1) A basic charge tariff for household consumption, with (2) a minimum charge for consumption giving a loss; (3) a rebate tariff or basic charge tariff for large consumers (manufacturers); and (4) special tariffs for very large consumers and for special purposes such as, for instance, heating of rooms.

During the discussion which followed the presentation of the report, various members expressed their views, and Mr. Dunn was asked to say what was being done in Great Britain regarding the matter. He stated in reply that a report under preparation by the National Gas Council would contain valuable information, which he suggested would be studied with appreciation by members of the Norwegian Gas Association, as soon as it was published. Mr. Irminger recommended them to examine this report with care.

Then followed consideration of the annual report of the Association. It contained nothing of exceptional interest. Mr. Irminger had ably represented the Association at the annual meeting of The Institution of Gas Engineers, which was held at Cardiff last June; and he had by request also acted as the representative of the Danish Gas Association on the same occasion.

It was decided that next year's meeting should be held in Oslo.

The election of President and Committee for the year 1928-29 was conducted by ballot, and it was announced amid applause that Mr. Irminger had been elected President.

PREVENTION OF RIVER POLLUTION.

Joint Advisory Committee's Recommendations.

The first report has been issued of the Joint Advisory Committee appointed to consider the position with regard to the pollution of rivers and streams, and any legislative, administrative, or other measures which may appear to be desirable for reducing such pollution. The Chairman of the Committee is Sir Horace C. Monro, K.C.B.

The first portion of the report (which is procurable from H.M. Stationery Office, Adastral House, Kingsway, W.C., and Branches, at the price of 2d. net) gives a brief sketch of the provisions of the principal statutory enactments on the subject, and points out that it is possible, under the law as it stands at present, for the Minister of Health, on the application of any one of the county councils or county borough councils through whose jurisdiction a river passes, to set up a Rivers Board to control the whole length of the river, including its tributaries, so far as it is subject to the Rivers Pollution Prevention Acts. The Committee recommend that the provisions of this section should be specially brought to the notice of these councils by the Department concerned; it being their belief that if this were done a number of applications would be forthcoming.

Establishment of Rivers Boards.

In the opinion of the Committee, the establishment of such Rivers Boards would be a first step towards the improvement of the condition of many of the rivers. As things are at present, though there is no lack of administrative authority for enforcing the law, it is generally admitted, they say, that a number of rivers are seriously polluted; the law designed to prevent avoidable contamination being to a large extent not put into operation. The evidence they have received goes to show that, for the prevention of such pollution, a body specially charged with the administration of the Acts, and operating throughout the whole or the greater part of a river basin, is far more effective than one working in a limited area, and occupied with a large variety of other duties. The area under the jurisdiction of any Rivers Board should be of sufficient size to permit of the employment of skilled officers, yet not so large as to make it impossible for the chief officers to keep themselves thoroughly informed as to the existence of any pollution and the most suitable means for its prevention.

In a later report, the Committee may suggest certain amendments of the law; but they are satisfied that no amendments would be of much value unless the administration of the law were placed in the hands of bodies representing one or more rivers, and keeping a continuous supervision over them, and this can be done under the existing law.

Rival Claims of the River.

"We recognize," the Committee say, "that the rivers are the natural channels through which the water that falls on the land, or is otherwise brought to its surface, has to be conveyed to the sea, and that in populated and industrial areas large quantities of the water have to serve domestic or commercial purposes before passing finally into the rivers. The purification of the water thus utilized is often a difficult and

expensive matter. Cases have been quoted in which the cost of a scheme for effectively treating the sewage of a district has been found to be altogether prohibitive. The rival claims of the river from the point of view of amenity, water supplies, and fishing, on the one hand, and of ratepayers and traders on the other, have to be viewed with a proper sense of proportion; and we do not suggest that it is possible to expect that all rivers can at once be converted into pellucid streams. But there is no reason why steps should not be taken to prevent needless, wilful, and remediable pollutions. That much can be done in this direction is shown by the experience of the existing Rivers Boards. Where these bodies have been established, although they have the power of taking proceedings against offenders, legal process is only resorted to in extreme cases. They have found it possible in the majority of instances to effect improvements by advice and persuasion. The relations between the Rivers Board and the manufacturers and local authorities are generally cordial. We do not suggest that any powers vested in Fishery Boards, in respect of pollution prevention, should be taken away."

POTENTIAL INVESTMENTS.

XVI.—PLYMOUTH AND STONEHOUSE GAS LIGHT AND COKE COMPANY.

The Plymouth and Stonehouse Gas Light and Coke Company was incorporated by Special Act in the year 1855, and further powers were obtained in 1879, 1894, 1898, 1903, 1916, and 1921. Head Office: 26, George Street, Plymouth. The statutory area of supply covers 40 sq. miles, and, in addition to Plymouth and Stonehouse, includes the towns and villages of Plympton, Compton Gifford, Crownhill, and Plymstock district. The consumers number 42,213.

The capital of the Company as shown by the last accounts (March 31, 1928) is as follows:

Capital Stocks.

	£
5 p.ct. standard ordinary stock	255,162*
7000 7½ p.ct. standard ordinary shares	70,000
3000 7 ,, ,, ,, ,,	30,000
Premiums received	84,838
Remaining to be issued	..
Total amount authorized	£440,000

* Includes £25,000 added on conversion of shares.

Loan Capital.

	£
3 p.ct. debenture stock	50,000
3½ ,, ,, ,,	20,000
7½ ,, redeemable ,,	69,835
Remaining to be issued	30,000
	£169,835
Less: Discount capital 3½ p.ct. debenture stock	653
Total amount authorized	£169,182

Transfer Arrangements.—Common form. Fee for registration of transfer, probate, death in joint holdings, marriage, or power of attorney, 2s. 6d.; distringas, *nil*. All classes of security can be transferred on same deed, without extra fee. Stocks are transferable in amounts and multiples of £1. Husband's witness of wife's signature or *vice versa* not accepted. Voting: as per Companies Clauses Consolidation Act, 1845—viz., 1 vote for every share up to 10; additional vote for every further 5 shares up to 100 shares; and an additional vote for every further 10 shares; £10 capital of any class = 1 share. Directors' qualification £500 ordinary capital. Auditors' qualification £10.

Accounts and Dividends.—Accounts are made up to March 31, and submitted in June; dividends being paid on Jan. 1 and July 1. The standard price of gas is 12¾d. per therm; present price, 6½d. per therm; declared calorific value, 450 B.Th.U. per c.ft. Dividends on the ordinary capital are subject to sliding-scale—viz., ⅛d. per therm above or below the standard price = ⅝ p.ct. per annum in dividend on 5 p.ct. stock, and ¼ p.ct. on 7½ p.ct. and 7 p.ct. shares.

The following table illustrates the progress made by the Company prior to the war and during the past five years. The years 1914 to 1922 are purposely ignored owing to the abnormal conditions then prevailing.

An examination of the statement reveals a very satisfactory position. The sales of gas show an increase of 86·76 p.ct. over the sales for the year 1903; the capital employed, 1s. 5d. per therm, or 6s. 4½d. per 1000 c.ft., compares with 7s. 6d. per 1000 c.ft. in 1903; and the price of gas is just under 40 p.ct. above the immediate pre-war price.

Year to March 31.	Average Gross Selling Price of Gas Per 1000 C.Ft.	Quantity Sold. Thousands C.Ft.	Capital Employed per 1000 C.Ft. Sold.	Gross Profit.	Total Charge for Capital. (*a*)	Rates of Dividend. P.Ct per Annum. (*b*)	Amount Carried Forward and Balance Reserve Fund.
	s. d.		s. d.	£	£	£ s. d.	£
1903	1 9	931,578	7 6	23,375	20,291	9 15 0 9 5 0 6 2 6	34,713
1908	1 10	1,040,385	7 8	29,524	21,697	9 10 0 9 0 0 6 0 0	39,592
1913	1 7	1,163,447	7 3	29,067	23,240	10 5 0 9 15 0 6 7 6	50,729
	d.	Therms.	Per Therm. s. d.				
1923	8·5	6,416,217	1 6	44,872	34,915	12 12 6 12 2 6 7 11 3	60,206
1924	6·75	6,953,845	1 5	29,989	36,003	13 5 0 12 15 0 7 17 6	54,196
1925	6·5	7,113,803	1 4	29,542	36,157	13 5 0 12 15 0 7 17 6	47,871
1926	6·5	7,394,972	1 6	33,087	38,996	13 5 0 12 15 0 7 17 6	41,244
1927	7·37	7,789,581	1 5	38,510	39,976	13 0 0 12 10 0 7 15 0	39,778
1928	7·3	7,829,415	1 5	41,945	40,807	13 5 0 12 15 0 7 17 6	40,915

(*a*) The total charge for capital includes dividend and interest paid and amount (if any) carried to reserve fund.
(*b*) The three rates of dividend shown above are on the 7½ p.ct. shares, the 7 p.ct. shares, and the 5 p.ct. stock respectively.

The following table shows the highest and lowest price of the 5 p.ct. ordinary stock during the past five years, the dividends paid, and the yield p.ct. per annum calculated on the average price.

Year.	Transactions. Highest.	Transactions. Lowest.	Dividend. (Year to March.)	Yield P.Ct. per Annum on the Average Price.
			£ s. d.	£ s. d.
1923	110	109	7 11 3	6 18 3
1924	117½	110	7 17 6	6 18 6
1925	111½	109½	7 17 6	7 2 6
1926	111	110	7 17 6	7 2 6
1927	110	106	7 15 0	7 3 6

The present average quotation is 109½; and having regard to the last half-yearly dividend paid (£7 17s. 6d. p.a.) the stock is very attractive. It is, however, closely held, and only on rare occasions is any available on the London market.

Issue of Stock at Newmarket.—The £5000 of stock recently offered by tender in the Newmarket Gas Company was largely oversubscribed; and no tender at less than £130 was accepted. Letters of allotment to successful applicants were posted on Monday last.

Shrewsbury Gas Company's Dividend.—At the annual meeting of the Shrewsbury Gas Light Company a dividend of 4 p.ct. was declared, making, with the interim dividend of 2½ p.ct. paid in March, a total of 6½ p.ct. for the year—an increase of ½ p.ct. Mr. H. J. Hearn, the Chairman, said there had been an increase of 2 million c.ft. in the quantity of gas sold, but there had been a slump in the market for residuals. The fuel bill was £12,000 less than in the previous year, but the reduction made in the price of gas brought down the receipts by £9000. A further reduction of 1d. per 1000 c.ft. was made on June 30.

Price of Gas Reduced at Dorchester.—The Directors of the Dorchester Gas and Coke Company, Ltd., announce a further reduction in the price of gas from 11·55d. to 11·11d. per therm, to take effect as from the readings of the meters at the end of the current quarter.

Doncaster Gas Cheaper.—The Doncaster Town Council have decided to reduce the price of gas by about 2d. per 1000 c.ft. From Oct. 1 gas will be reduced by ½d. a therm, while in lieu of the present discount system a new scale of charges for gas taken on any one premises will come into operation. The charges are 9½d. for general purposes, and 8d. for power for quantities up to 250 therms per quarter, and 7½d. and 6½d. for quantities ranging from 4000 to 6500 therms. These prices will be subject to a 5 p.ct. discount if paid within fourteen days.

CONDENSATES FROM GAS IN HIGH-PRESSURE MAINS.

[An investigation by Prof. Dr. K. BUNTE and Dr. A. KAMMUKER, at the German Gas Institute, Karlsruhe. From "Das Gas- und Wasserfach."]

(*Concluded from p. 493*)

NATURE AND QUANTITY OF VAPOURS IN COAL GAS.

Comparatively little is known of the "heavy" hydrocarbons which are present as vapours in coal gas, and which are commonly grouped together as C_nH_m. We know that the chief part of C_nH_m is ethylene. We know further that, in general, the gas is almost saturated with naphthalene, and finally that benzole is usually present in quantities of about 30 grammes per cub.m. In connection with recent investigations into the characteristic odour of town gas, carried out in the Karlsruhe Institute on the production of the local works, which is washed for benzole, experiments were made with cooling the gas first with an ether carbon dioxide freezing mixture, and then with liquid air. The mixture of condensates, amounting to 200 grammes per 20 cub.m. [about 700 c.ft.], was fractionated with the following results:

Boiling, ° C.	Grammes per Cub.M.	
35– 41	1·2	
55– 75	0·5	
75– 83	2·8	5·9
83– 90	2·4	
90–100	0·7	
100–105	0·3	
105–113	1·2	
113–120	0·1	
120–130	0·1	
130–142	0·2	
142–155	0·2	
155–163	0·15	
Remainder	0·15	

Naturally, with such small quantities, the exact identification of the fractions was impossible, and it is of small importance in its bearing on the present question as to whether these substances are present in quantities approximating to saturation, or far below it. With sufficient accuracy for present considerations (though it can by no means be stated as a law of physics) it may be assumed that substances which have approximately the same boiling-points will give also the same vapour tensions as one another at 10° C.

In the following table, which includes a number of substances known to exist in tar, and whose presence in small quantities may therefore be assumed in gas, it can be seen what quantities would be likely to be present at 10° C. and 760 mm. pressure:

Substance.	Boiling-Point at 760 mm.	Saturation Pressure at 10° C.	Mol. Weight.	Grammes per Cub.M. Gas 10° C. 760 mm.
Carbon bisulphide	46	196	76	845
Cyclopentadiëne	41	(200)	66	(750)
Hexane	69	75	86	365
Acetonitrile	79	(40)	71	(90)
Benzole	80·4	44	78	198
Thiophene	84	..	84	..
Tetrahydrobenzol	83	(40)	82	(185)
Heptane	98	20	100	113
Toluol	111	12	92	67
Pyridine	117	8	79	36
Pyrrol	133	(4)	67	(15)
Ethylbenzol	134	4	106	24
Picolin	135	(4)	93	(20)
Xylol	139	2·66	106	16
Lutidine	143	(2)	107	(10)
Styrol	145	(2)	104	(10)
Mesitylene	164	(0·8)	120	(5)
Methylpyridine	165/68	(0·7)	121	(5)
Pseudocumene	168		120	
Cumene	169		118	
Dicyclopentadiëne	170	(0·6)	132	(4·5)
Indol	178	(0·3)	116	(2)
Aniline	184	(0·15)	93	(0·8)
Phenol	282	(0·2)	94	(1·0)
Ortho-cresol	187	(0·1)	108	(0·75)
Benzonitrile	196	(0·08)	103	(0·4)
Toluidine	197/99	(0·07)	107	(0·4)
Naphthalene	218	0·621	128	(0·15)
Chinolin	239	(0·02)	129	(0·15)

For the figures in parentheses, the exact equivalents are not known. The values inserted are estimated either from vapour-pressure determinations at higher temperatures, or by analogy. They are probably fairly accurate.

From the first table, it can be seen what quantities there are of substances having boiling-points between any two limits. For instance, between 75° and 100° they total 5·9 grammes per cub.m. of gas. Comparing the last column of the second table, it can be seen that all these substances are present in quantities far below saturation point. There could, as a matter of fact, be from 100 to 200 grammes of each, whereas the total of them all is barely 6 grammes. Even if the whole 5·9 grammes were pure benzole, condensation would only take place at a pressure of something like 34 atmospheres. It can safely be concluded that even under fairly high compression no condensates will be formed from these substances. Exact calculations on the subject cannot, however, be made, even taking for granted much that is unknown about them, and assuming values for their saturation pressures.

If it was a question of the vapours of substances which will not mix in the liquid state, then each individual one would have its own vapour tension, and could satisfy the equivalent partial volume to this partial pressure. An exact identification could then give the required information. The nature of the condensate shows, however, that we have to deal with liquids which all mix. The knowledge of the vapour pressures even of binary mixtures is so far confined to a very few mixtures of two substances. The only law which has emerged from investigations shows that both the individual pressures and also the total pressure are reduced in mixture—the latter, under certain conditions, very considerably. Concerning the behaviour of the vapours of a considerable number of liquids in mixture, as they occur in the case of the hydrocarbons of coal gas, nothing at all is known.

SUMMARY.

To the numerous inquiries which have reached the "Gas Institute," as to whether, and in what quantity, condensates are to be expected in high-pressure gas mains, no general answer can be given. Even the total quantity of hydrocarbons varies very considerably. The above results, based on the particular gas supplied at Karlsruhe, which is subjected to benzole extraction, are only an example. Even the proportion of each individual substance in various gases is subject to endless variation, and, as the bracketed figures in the table show, the exact saturation pressure values are unknown in the majority of cases. It might be worth while undertaking detailed investigations of these, if there was any chance of their leading to definite conclusions on the subject under review. As, however, it is a question of the vapour pressures not of individual substances or even of simple binary mixtures, but of complicated mixtures of varying quantities, even a labour of this magnitude would lead to no definite conclusion. There would, in fact, be little more to say than that the majority of the hydrocarbons are present in the gas in quantities considerably below saturation; water vapour and, unfortunately, naphthalene being exceptions. That consequently, even under high pressure, the formation of condensates in serious quantities is not to be expected. To forestall any misunderstanding, it should be mentioned that oil gas may give rise to totally different conditions, since hydrocarbons of all kinds constitute the bulk of it.

SOME EXPERIENCES IN PRACTICE.

In order to throw further light, and to confirm these theoretical findings, the Gas Institute had broadcast inquiries among all known users of high-pressure systems in Germany, and had received a number of informative replies. It is mentioned, however, that in no case are such high pressures in use as are customary, for instance, for natural gas distribution in America (which incidentally contains no naphthalene), nor such as are envisaged in the Ruhr gas scheme. The latter provides for initial pressures up to about 30 atmospheres, whereas 4·5 is about the maximum in the returns received by the Institute.

In every case it is noted that condensation is in evidence only at the beginning of the system. This was to be expected, as it has been shown above that, as comparison diminishes, so the conditions of permissible partial pressure to total pressure become more favourable. Water condensation at the beginning of the mains is general, and in 38 p.ct. of the cases there is no trace of any impurity. In 20 p.ct., minute traces of oil were reported, but so small that even a laboratory example could not be separated for analysis. A few other cases identified the traces of oil as composed mostly of compressor oil, and this was most noteworthy when the gas, in the compression process, attained a temperature of 30° C. or over. Others again, especially with new mains, found viscous tarry deposits, which were identified as a solution of the inner coating of the pipes. Only three works complained of naphthalene deposits, and 18 p.ct. reported that condensates were similar to those usually found in ordinary low-pressure systems.

These results may be said to confirm, in general, the conclusions drawn from the theoretical investigation above. Even if they provide no absolutely certain solution of the question of condensation in mains at considerably higher pressures, they indicate that the risk of naphthalene disturbance is a reality, but that no trouble need be anticipated from the hydrocarbons which are contained in the gas in quantities far below saturation point.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

World Power Conference on Fuel.

SIR,—No subject touches more deeply the future of our national prosperity than the economic utilization of our fuel resources. The World Power Conference on Fuel, which is to be held in London from Sept. 24 to Oct. 6, promises to be of outstanding importance. Conferences and meetings organized by the various vigorous technical societies interested in fuel give us the opportunity of keeping in touch with developments in this country. But the particular value of this World Power Conference is to enable us to learn of the progress in other countries. The papers which are to be presented come from all parts of the world, and are put forward with the authority of some technical body in the particular country from which the paper originates.

We have had the opportunity of studying many of the 150 contributions—some from America, some from Germany, some from Russia, some from Great Britain—and have no hesitation in stating that much of the information contained therein is of unique value, and has never before been made available.

We therefore avail ourselves of your valued columns to emphasize to our colleagues in the fuel world that to miss this World Power Conference is to lose a golden opportunity of acquiring, within the space of a few days, a fuller realization of world knowledge on fuel matters.

Full information can be obtained from the Secretary at this address.

C. H. LANDER.
EDGAR C. EVANS.
A. E. DUNSTAN.
E. W. SMITH.

Central Office,
36, Kingsway, W.C. 2,
Sept. 5, 1928.

REGISTER OF PATENTS.

Meters.—No. 295,105.

KIRKEWHITE ENGINEERING CO., LTD., and GOLDSPINK, G. E., both of Nottingham.

No. 16,554; June 22, 1927.

This invention refers to improvements in the means described in the specification No. 229,512 [see JOURNAL, Vol. 170, p. 128], for connecting the centre of each diaphragm to what is usually termed the flag. Its object is to give the diaphragms as much freedom as possible, so that they will move freely through the full distance required, and will not cause any unsteadiness in the gas supply. According to the invention, the centre of each diaphragm is connected to the free end of the corresponding flag by means of a **T**-shaped connecting link, which is articulated to both the flag and the diaphragm, instead of being rigidly connected to the latter.

The claims show that this link consists of a central part which has its end articulated to a central stud in the diaphragm and is provided at its outer end with a tubular cross-head at right-angles to the central part, which cross-head is located between bearings on the free end of the flag or rocking shaft arm and is jointed to the latter by a removable joint pin passing through the bearings on the flag and the tubular cross-head.

Clockwork Gas Controllers.—No. 295,296.

HORSTMANN GEAR CO., LTD., and HORSTMANN, A., both of Bath.

No. 8966; April 1, 1927.

This invention relates to improvements in the time mechanism for use in conjunction with gas controllers. The specification is accompanied by 25 drawings, and the following claims are set forth: In clockwork gas controllers a going barrel provided with a bearing for the winding arbor, which bearing is concentrically adjustable in relation to the barrel, and may be used to carry a dial plate or to convey movement from the going barrel to mechanism exterior thereto.

Clockwork gas controllers in which the going barrel is mounted exterior to the clockwork frame-plates and connected with the clock train by suitable gearing conveyed through an extended spindle of one of the train wheels; the concentrically adjustable bearing being on the front of the going barrel and carrying the dial plate affixed thereto, thereby rendering the dial plate adjustable to the going barrel.

In a gas controller the use of a going barrel with concentrically adjustable bearing for the winding arbor mounted between the frame plates; the said concentrically adjustable barrel bearing forming also a bearing for the barrel through the front plate, a hollow bearing for the barrel arbor, a hollow boss to which the dial is fixed exterior to the frame plates, and an adjustable means whereby the dial is set to time.

In a gas controller a concentrically adjustable bearing for the winding arbor provided with means for adjusting the friction of the bearing in relation to the barrel.

In gas controllers a going barrel with concentrically adjustable winding arbor bearing, a frontwardly projecting hollow boss on which is rigidly mounted a time dial, carrying tappets adjustable thereto, the tappets being secured to the time dial by a clamp attached to the concentrically adjustable winding arbor bearing, this clamp being adapted to be used as a handle whereby the dial plate is set to time.

Gas Drying—No. 295,411.

COOPER, C., HENSHAW, D. M., and W. C. HOLMES & CO., LTD., all of Huddersfield.

No. 9618; April 7, 1927.

This invention relates to the drying of gas by bringing it into contact with water-absorbing bodies in a liquid state, hereinafter referred to as "liquor," with the periodic treatment of the liquor to expel the water taken up from the gases in order that the liquor may be employed in the treatment of further quantities of gas. The object of the invention is to take into account the variations in the rate of production and consumption of gas which normally occur, so that the amount of supervision of the drying operation may be minimized.

The rate of withdrawal of the liquor, for reconcentration, and the corresponding rate of return of the reconcentrated liquor are maintained substantially constant during the period comprising a single complete sequence of diurnal variations in consumption or production, and are so proportioned that the variations from the average concentration in the liquor will be small, and will not result in material changes in the degree of dryness of the treated gas. The degree of reconcentration of the liquor may be varied, being greater when the flow of gas through the apparatus is higher. Preferably, however, the degree to which the liquor is reconcentrated is also fixed or maintained constant during the whole period comprising a single cycle of variations in rate of gas flow, being so proportioned that variations in the dryness of the gas are negligible

Where the quantity of liquor employed is sufficiently large, the heat capacity of the body of liquor relatively to that of the gas being correspondingly great, the liquor leaving the washer will show only a slight dilution and a moderate rise in temperature. This liquor may be delivered to a tank the capacity of which, in association with the capacity of the washer, will be sufficient to contain the necessary relatively large quantity of liquor. In such case a pump may be provided for drawing liquor from this tank and forcing it through coolers; and means will be provided for delivering a relatively small proportion of the liquor maintained in circulation to means adapted to secure the reconcentration of the liquor, and to return the reconcentrated liquor to the tank.

In an alternative arrangement, a small vessel may be provided into which the pump delivers; and from this vessel a continuous feed for the means of securing the reconcentration of the liquor may be secured, the greater proportion of the liquor withdrawn from the washer being returned thereto if necessary after cooling.

Where the treatment of the gas is effected after it leaves the holder, it may be necessary to avoid the rate of flow of the gas being materially reduced by friction; and in certain circumstances it may be undesirable to employ mechanical washers for bringing the gas into intimate contact with the liquor. However, in the majority of works the employment of fans or boosters for assisting the flow of gas during the period of large demand is resorted to in order to overcome the frictional resistance in the distributing system itself; and in such cases the means for assisting the flow of gas during these periods may also be employed for overcoming any frictional resistance in the apparatus provided for bringing the gas and liquor into intimate contact. In these circumstances, the use of apparatus of the type in which the gas is caused to bubble through the liquor with which it is to be treated may be found convenient.

Gas Burner Regulators.—No. 295,457.

GENERAL GAS APPLIANCES, LTD., and COLEMAN, F. S., both of Manchester.

No. 14,250; May 27, 1927.

The object of this invention is to provide an improved construction of atmospheric gas burner regulator which will embody multiple jet construction and in which simple and efficient means are provided for the regulation of the jets. The regulator comprises a cylindrical gas nozzle unit, an air regulator screw disc on the nozzle, a plurality of perforations in the end face of the nozzle, a single or two part cylindrical sleeve within the nozzle adapted on rotation of the sleeve to cover or uncover some of the perforations, and external means for adjustably rotating said sleeve. These external means comprise an adjusting screw mounted in, and transversely of, the nozzle unit adapted to engage tangentially with a part of the cylindrical sleeve in a similar manner to a worm and worm-wheel, so as to effect rotational adjustment of the sleeve. The screw will be suitably fitted to prevent gas leakage from the nozzle, and the sleeve may be pro-

vided with a light spring to hold it in close contact with the surface in which are the perforations it is covering.

Fig. 1 is a sectional elevation of one example of the regulator, and fig. 2 is a sectional end elevation showing the adjusting screw; the cylindrical sleeve being shown in full.

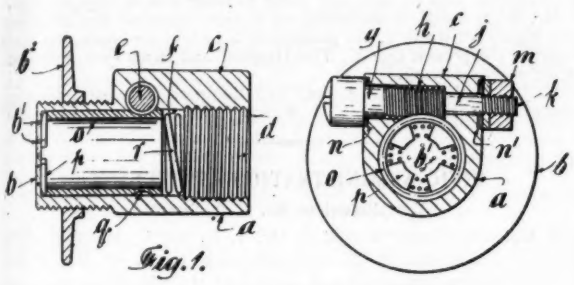


Fig. 1.

Fig. 2.

A New Gas Burner Regulator.

The nozzle unit *a* is formed with a flat perforated end *b* and a lug *c* to carry the transverse adjusting screw; the nozzle being adapted at *d* to be screwed on to the end of a pipe in the usual manner. The lug *c* is drilled to accommodate the adjusting screw *e* transversely of the axis of the nozzle, and so that the thread of the screw enters the cylindrical bore *f* of the nozzle. This adjusting screw *e* is formed with a cylindrical portion *g* adjacent to the head, a central threaded portion *h* of the same external diameter, a further cylindrical portion *j* of reduced diameter, the end *k* of which is threaded to take a nut *m*. The cylindrical portions of the screw are proportioned to be substantially a gas-tight fit in the casing; but to ensure against leakage, and to allow of a fairly easy fit for adjustment, leather washers *n*, n^1 are provided at each end against the faces of the lug.

In the cylindrical bore of the nozzle is a hollow cylindrical sleeve *o* with its end partly closed by four segmental parts *p* which are adapted to lie against the flat perforated inner face of the end of the nozzle, leaving a star-shaped part thereof open to the interior of the sleeve. The perforations or jet holes b^1 in the end *b* of the nozzle are arranged so that there are five holes in the centre which are never covered by the sleeve, and four groups of holes which are adapted to be covered by the segmental parts of the sleeve.

The sleeve towards the back end is formed on the outside with a groove *q* of arcuate section, in which are cut worm teeth to coact with the central threaded portion *h* of the adjusting screw.

In order to ensure correct contact of the blanking-off portions *p* of the adjusting sleeve, a coil spring *r* may be provided which will lie between the sleeve and the end of the pipe to which the nozzle is to be connected, or which may be separately secured within the nozzle, as by a small ring screwing into the threads for the pipe connection. The end of the nozzle is screwed on the outside and provided with an air regulator disc b^2.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Aug. 22.]

Nos. 23,240—23,854.

CRAIG, G.—"Low-temperature distillation of coal." No. 23,800.
DRAKE, J. W., and DRAKES, LTD.—"Treating and conveying coke discharged from retorts." No. 23,247.
EDWARDS, H.—"Manufacture of coke." No. 23,556.
FALLON, J.—"Carbonization of coal." No. 23,449.
GEAKE, W. H. G.—"Gas-fired water heaters." No. 23,724.
KERR, I. W.—See Geake, W. H. G. No. 23,724.
KING, F., and KING & Co. (BATH), LTD., F.—"Gas burners." No. 23,551.
MENDEL, S.—"Automatic safety apparatus for gas lighting appliances." No. 23,808.
MITCHELL, J.—"Gas meters." No. 23,303.
PINTSCH AKT.-GES., J.—"Water gas generators." No. 23,283.
PLANET FOUNDRY COMPANY, LTD.—"Dampers for cooking stoves." No. 23,592.
RADIATION, LTD.—"Gas heated cooking apparatus." No. 23,627.
ROACH, H.—See Geake, W. H. G. No. 23,724.
SMALLWOOD, A.—"Carbonization of coal." No. 23,449.
TOZER, C. W.—"Vertical retorts." No. 23,577.
WHITEHOUSE, J. M.—"Conveyors for coal." No. 23,401.
WOOD, W. R.—"Retorts, &c." No. 23,555.
YATES, H. J.—See Radiation, Ltd.—No. 23,627.

MISCELLANEOUS NEWS.

SIR JOHN CASS TECHNICAL INSTITUTE.

We are pleased to note that the need for a higher standard of technical education in the gas-making and allied fuel industries has been fully recognized by the Sir John Cass Technical Institute in its syllabus of courses for the coming session.

In addition to the instruction provided in such basic subjects as chemistry, physics, &c., special attention is being devoted to the application of these sciences to the various problems which arise in the coal carbonizing industries, with the result that a very comprehensive course of training is available. The full curriculum extends over five years, and includes courses on such important subjects as "Gas Manufacture," "Fuel and Refractories," "Mechanical Drawing," "Physical Chemistry and its Applications to Gas-Works Problems," &c. We understand that students can now be prepared not only for the examinations of The Institution of Gas Engineers, but also, in the case of University graduates, for the M.Sc. degree in coal carbonization.

The courses being given during the coming session, commencing Sept. 27, which are of special interest to those engaged in the gas industry are notified in our advertisement pages this week.

GLASGOW CORPORATION GAS ACCOUNTS.

In their fifty-ninth annual report to the Corporation, covering the financial year from June 1, 1927, to May 31, 1928, the Glasgow Gas Committee state that the gross revenue amounted to £2,316,331, and the gross expenditure to £1,289,757, to which was added £99,339 depreciation written-off capital assets, leaving a balance to be carried to the credit of profit and loss account of £927,234, which compares with a debit of £658,926 for the previous year. After meeting charges for annuities, interest, and sinking fund there remains a surplus on the past year's operations of £628,083, whereas twelve months ago there was a deficit of £946,336.

The quantity of coal carbonized during the past year was 597,347 tons, as compared with 661,042 tons for the preceding year, a decrease of 63,695 tons. The average cost per ton was 17s. 5·25d., being a decrease of 40s. 2·43d. over the preceding year. The coal gas made per ton carbonized was 14,546 c.ft., which, with water gas, gave an average of 15,113 c.ft., as compared with 13,368 c.ft. and 14,539 c.ft. respectively per ton for the previous year. The quantity of gas delivered and accounted for during the year amounted to 8,870,593,574 c.ft., as compared with 9,055,799,297 c.ft. for the preceding year, a decrease of 185,205,723 c.ft., equal to 2·04 p.ct. The unaccounted-for gas was 7·5 p.ct., against 7·8 p.ct. The greatest quantity of gas sent out during the year in 24 hours was 40,650,000 c.ft.; the maximum daily make being 39,370,000 c.ft.

The net sum realized from the sale of coke this year amounted to £160,352, being £172,034 less than that of the preceding year. The total quantity sold was 295,392 tons, compared with 334,225 tons, a decrease of 38,833 tons. The average price received was 14s. 6·268d. per ton, as compared with 22s. 6·949d. for the previous year, a decrease of 8s. 0·681d. per ton.

The number of ordinary meters in use on May 31 last was 199,283—an increase of 2811. The prepayment meters in use numbered 110,183, an increase of 906, giving a net increase of 3717 meters. During the year 22,488 meters were repaired at the workshops. At May 31 there were on loan 175,088 cookers and range fittings, 20,225 grillers, 64,750 boiling burners, 63,611 gas fires on hire, 6001 radiators on hire, and 1743 water heating appliances on hire—a total of 331,418, as compared with 339,623 in the preceding year.

A SATISFACTORY YEAR AT SALFORD.

Report of the Gas Committee.

The annual report of the Salford Gas Committee for the year ended March 31 records a most successful year's working. At the commencement of the year there was an accumulated debt owing to the city fund of £53,993. The whole of this amount has been paid off, a contribution of £12,090 has been made to the city fund in aid of rates, and the sum of £5117 has been repaid to the reserve fund account.

The number of consumers has increased during the year. The sales of gas have, however, shown a decrease equal to 6·58 p.ct. This was, of course, expected, for the sales of gas in the previous year were abnormally high owing to the coal stoppage. The quantity of gas made was 1980 million c.ft., compared with 2089 millions in the previous year. The total number of gas cookers (ordinary and prepayment) on hire at March 31 was 27,847—an increase of 758 during the year—and the total number of gas fires on hire at the same date was 8385, an increase of 59 during the year.

In May last the Committee decided to recommend the Council to reduce the price of gas, and passed the following resolutions:

> That from and after the reading of the meters for the quarter ended June 30 the price of gas to all consumers by ordinary meters within the area of supply be reduced by 6d. per 1000 c.ft.
>
> That from and after the date of the first collection from each meter after June 30 the price of gas to all consumers by prepayment meters within the area of supply be reduced by increasing the quantity of gas supplied for one penny from 18·29 to 20·43 c.ft.
>
> That from and after the reading of the meters for the quarter ended June 30 the scale of charges for gas to all consumers by ordinary meters within the area of supply be altered so that, with the reduction of 6d. per 1000 c.ft. previously recommended, the new scale of charges will be based on the quantity of gas used; the net price varying from 3s. 8d. to 2s. 8d. per 1000 c.ft.

These recommendations were approved by the Council on June 6 last.

MANCHESTER GAS DEPARTMENT.

The Question of Management.

At a meeting of the Manchester City Council on Sept. 5, Councillor J. W. SUTTON moved the following resolution:

> That arising from recent incidents in connection with the Gas Committee, a Special Committee (consisting of six members who are not members of the Gas Committee) be appointed to inquire into the administration of the Gas Department and to present a report thereon to the Council.

In a lengthy speech Councillor Sutton spoke of "an air of suspicion" which had been gathering over the Gas Department. He complained that the interest on loan debt was increasing, and of inexplicable fluctuations. The distribution of gas was costing more *pro rata* within the last few years, and the profit made in the Department was very erratic. In 1924 it was 22 p.ct., in 1925 14 p.ct., in 1926 16 p.ct., in 1927 7 p.ct., and in 1928 31 p.ct. If there had been a general manager, technically fitted for his job and able to devote his whole time to it, there would have been uniformity. Finally, there was the recent accident. No one could feel safe on reading the words of the Inspector, in his report on that accident, that since 1881 there had been only two occasions when the gasholder was externally examined.

Councillor ALFRED JAMES having seconded the resolution, Alderman TOM COOK, Chairman of the Gas Committee, said the Committee would not oppose a demand for an inquiry. "The members of the Committee," he said, "and its Chairman are as pure in their actions as any of the self-constituted guardians of the interests of the Gas Committee. We do not fear any inquiry." He charged the supporters of the resolution with wishing to hamper the new Manager, and ended: "You can have your inquiry, and we will give you every facility, but we are not going to be a party to it."

Councillor SUTTON replied that the Committee were not very keen on an inquiry a month ago, and had reconsidered their position when the Government report came out.

The resolution was defeated, 21 voting for it and 22 against.

PUBLIC LIGHTING IN LIVERPOOL.

The report of the Liverpool City Lighting Engineer, Mr. P. J. Robinson, on the work of his Department for the year ended March 31 last has been published.

With regard to gas lighting, it is stated that there has been a further reduction in the number of gas lamps, due to the electric lighting of main thoroughfares, but the work of substituting 4-light lamps in lieu of 2-light in some of the more important streets, principally in the centre of the city, has been continued, and a few 2-light in lieu of 1-light have also been installed. In addition, 1 4-light, 14 2-light, and 11 1-light lamps have been fixed in adopted, and 2 2-light and 58 1-light in unadopted, streets, and 5 lamps have been erected in unadopted passages. The work of providing an auxiliary light on those standards electrically lighted which are situated in exposed positions in the carriageways has been completed, two 1-light gas lamps having been fixed on each standard, which are lighted throughout the night. At the end of the year, there were 8555 electric lamps and 17,782 gas lamps, making a total of 26,337.

The gas meter testing branch of the Department's work continues to grow, the number of meters tested having increased from last year's record figure of 39,921 to 47,197, and the fees from £2262 to £2743. Of the total meters tested, 29,950, or 63 p.ct., were of the prepayment type, and 1675, or 3½ p.ct., were rejected.

The following details as to the reasons for rejection may be of interest:

Incorrect registration	936
Internal leakage	174
External leakage	165
Passes gas without registering	137
Will not pass gas	125
Excessive absorption of pressure	47
Will not stand pressure of 5 in.	69
Defective markings	11
Defective index	6
Other causes	5
Total	1675

CO-PARTNERSHIP AT ALDERSHOT.

Annual Meeting.

The Annual Meeting of the Aldershot Gas, Water, and District Lighting Company's Co-Partnership and Hospital and Benevolent Fund was held on Sept. 5; the chair being occupied by Mr. R. W. EDWARDS, the Chairman and Managing Director of the Company.

The CHAIRMAN, in moving the adoption of the report, referred to what had been done in regard to the prices of their commodities since the general strike of 1926. At Midsummer last year, he said, the price of gas stood at 14·4d. per therm. At Lady Day this year, the figure had been reduced by the substantial amount of 2d. per therm (equal to 10½d. per 1000 c.ft.), and at the close of the co-partnership year stood at 12·4d., permitting a co-partnership bonus at the rate of £6 4s. p.ct., and to the "B" shareholders a dividend at the rate of £4 3s. 6d. p.ct., for that half-year. This latter dividend compared with a pre-war dividend of £4 14s. It was hoped that there would be a further reduction in price, dating from the Christmas readings. The electricity department was assuming increasing importance in their operations, and they were making a bid for consumption generally, and for day loads in particular. On Feb. 23 last they resolved to reduce the price of electricity for other than lighting purposes, where metered separately, by successive quarterly amounts, commencing at Midsummer; and subsequently, realizing how important this load would be in the development of their business, they determined further to continue that programme until such time as a basic rate of 1½d. per unit had been reached. This rate was subject to a scale of discounts for day consumptions. They had reduced their lighting rate to 7½d., and hoped to lower this as time went on.

Mr. E. HORTON, in seconding the motion, observed that the bonus was highly satisfactory, but possibly by a little more effort they could improve the present figure. The Hospital and Benevolent Fund was doing excellent work.

Mr. A. V. BARRACLOUGH, the Chief Engineer, supported the adoption of the report, and Mr. F. A. RICKETTS, the Secretary, also spoke.

CIVIC ADMINISTRATION IN BELFAST.

Compliment to Mr. J. D. Smith.

A high compliment is paid to Mr. J. D. Smith, Manager of the Belfast Gas-Works, in the comprehensive report of Mr. Arthur Collins, Expert Accountant and Adviser of Municipalities, of London and Birmingham, who was engaged by the Corporation to investigate the entire system of civic administration. So impressed was Mr. Collins with the management of the gas-works—especially in regard to labour control—that he has recommended that the engagement of all workmen in ordinary cases, for the entire Corporation service, be placed in the hands of one official, and he mentions the head of the gas-works, Mr. Smith, as being qualified for this duty.

The Corporation Special Committee, taking their cue from Mr. Collins, recommended that Mr. J. D. Smith be appointed Labour Adviser to the Council, and as from Jan. 1, 1929, take charge of the engagement and transfer of all workmen, whether skilled or unskilled, from time to time required by the various departments of the Council, except such technical men as may be specified in a schedule prepared by Mr. Smith in consultation with the heads of other departments; and that Mr. Smith be directed, after making such inquiries as may be necessary, to prepare a scheme showing in detail how he would suggest this work should be carried out, and submit it to them for consideration.

GAS REGULATION ACT APPLICATIONS.

SPECIAL ORDERS.

Leek Urban District Council.

To extend the limits of supply, to empower the Council to make differential charges, to authorize the acquisition of additional lands, and to empower the Council to borrow further money.

Rugby Gas Company.

To provide for the conversion of shares into stock, to extend the limits of supply, and for other purposes.

Gas Lighting Contract at Chester-le-Street.—The Chester-le-Street Council have agreed that a five-year lighting contract be entered into with the Newcastle and Gateshead Gas Company. Under the new contract, the gas lamps in the area, with the exception of five, will be lighted all the year round, and extinguished half-an-hour after midnight.

Houghton-le-Spring District Gas Company.—The Company have removed their showroom from 8, Sunderland Street, to more commodious premises at 100, Newbottle Street, Houghton-le-Spring. The new showroom and office are beautifully fitted with Sugg "Flambeau" brackets and "Bon Marché" lamps with distant control device and pneumatic switches. The outside lighting consists of four 6-light "Littleton" lamps controlled from the interior. There are a kitchen sink with a Ewart "Brilliant" geyser, and a bath equipped with a Parkinson "Treasure" geyser in working order for demonstration purposes. The office and accounts counter is at the rear of the showroom.

Progress at Taunton.—At the annual meeting of the Taunton Gas Light and Coke Company on Aug. 31, the following dividends were declared. On the 1897 preference stock, 5 p.ct.; on the 1920 redeemable preference stock, 7 p.ct.; on the consolidated "A" stock, 9 p.ct.; on the "yellow" shares, 7⅞ p.ct.; and on the new (1897) ordinary stock, 7⅞ p.ct. Mr. R. Bruford, the Chairman, explained that the output of gas showed an increase of 7 p.ct. over that of the previous year, notwithstanding the fact that the output in 1926-27 was 5 p.ct. up on that of the preceding year. During the year under review considerable reduction had been made in the price of gas, so that they had received a decreased amount for a much larger quantity of gas sold—notwithstanding which the Company were paying their full dividends and were carrying forward a slightly larger sum than last year. By further economies they hoped soon to reduce the price of gas again, and the Company had recently on their own initiative asked the Board of Trade for a lower standard price than that mentioned in their Order. During the year, 300 additional cookers had been fixed, and over 400 gas fires and 400 gas coppers. The output of gas had nearly been doubled in the last ten years. In regard to the works generally, they had been kept fully up-to-date. The drying process had continued to be a striking success, and would undoubtedly largely lessen the corrosion of mains and services in the future. Stoppages of service pipes were practically unknown, and the annual cost of meter repairs had been reduced by more than 50 p.ct. The annoyances of naphthalene stoppages had also been completely eliminated. A vote of thanks to the Directors was passed, and appreciation was expressed of the services of Mr. C. Harris, the Engineer, Manager, and Secretary, to whom the success of the Company is largely due.

MINISTRY OF HEALTH INQUIRY AT BRADFORD.

By spending £80,000 on improvements of plant, the Bradford Corporation Gas Committee will, in the opinion of the Gas Engineer (Mr. E. J. Sutcliffe), effect a saving equal to £25,000 a year.

At a Ministry of Health inquiry conducted at the Town Hall by Mr. G. Ewart Rhodes, a Ministry Inspector, into the application for leave to borrow the £80,000, it was stated that the saving would be effected by extensions to the plant at Birkshall. These extensions will make possible the transference of a make of 400 million c.ft. of gas to the Birkshall Works from those at Valley Road.

Instead of paying off the borrowed money in three years by means of the saving, the amount will be paid off at the rate of £6400 a year, and much of the benefit will be passed on to consumers in the way of reduced prices of gas.

Among the variety of works allowed for is the laying of three miles of 12-in. steel gas main to connect the Valley Road with the Birkshall Works, at a cost of £14,900. This is the biggest item. High-pressure plant to drive the gas through these mains is to be provided at a cost of £4600. Five purifiers of gas made at the Birkshall Works are also part of the general scheme; these will cost £14,800, and the building to house them £4600. Another special feature is the contemplated introduction of carburetted water gas plant at £8330. To this the Medical Officer of Health (Dr. J. J. Buchan) had written stating that he had no objection.

HISTORY OF GAS SUPPLY IN REIGATE AND DISTRICT.

In the "Surrey Mirror and County Post" for Aug. 17 there was an article entitled "Old Reigate: The History of Gas Supply in Reigate and District," by "E. S.," who will be recognized by many readers as Mr. Ernest Scears, the Engineer to the Redhill Gas Company. What follows is extracted from that article.

We in the present day can probably form only an imperfect conception of the numerous difficulties that beset the pioneers of gas supply; prejudices had to be eradicated and established customs altered. The idea that light and heat could be conveyed through pipes was so novel as to be almost impossible for the public to grasp. But apparently the people of Reigate soon realized the advantages of gas over tallow candles, rush-lights, and oil dips, for we find that in 1841, three years after the opening of the works, a first dividend of 7½ p.ct. was paid, the capital of the Company increased, and considerable extensions were made to the works and mains. In that year, in addition to a large number of lights supplied by rent, gas was supplied to 31 houses by meter, and there were 26 public lamps and 8 private street lamps. In only two years did the old Reigate Company have to record insufficient funds to pay a dividend. In 1842 this was attributable to the fact that a sum of £90 for public lighting had not been paid by the Lighting and Watching Committee; and in 1850 the failure of Messrs. Nash & Neale's Bank at Reigate (who had been the bankers of the Company since its formation) resulted in a loss of £71. The year 1860 was an important one in the history of gas supply in Reigate and district. The old Reigate Works had for some years been working to their full capacity during the winter months, and it was decided to raise further capital and build new works on a piece of land purchased from Mr. Larmer on the north side of Batchelors Field in Nutley Lane. These new works were completed by Christmas, 1860, and leased for a term of 21 years on a guarantee of 6 p.ct. dividend to a Mr. Squire, and thence onwards the record is one of continued success and advancement. The Company was registered as a Limited Company under the Companies Act of 1862, with a capital of £8000.

The coming of the railway in 1841 was responsible for the growth of the Redhill end of the town, and for some years there was a demand for a supply of gas to that part, which the Reigate Company were unwilling to satisfy by the extension of their mains. This want was eventually satisfied by the erection of a gas-works on part of the site of the existing Redhill Works in 1860 by a private company.

The Redhill Gas Company.

In 1865 the Redhill Gas Company was incorporated by Act of Parliament with a capital of £50,000 and a mortgage limit of £12,500, for the purpose of supplying gas "to the inhabitants of Warwick Town and Redhill in the Foreign of the Parishes of Reigate" and its neighbourhood.

The Company were authorized by Statute to supply gas even in the Borough of Reigate, but an agreement was made between the two Companies by which the Redhill Company agreed in perpetuity not to supply gas in that portion then being supplied by the Reigate Company, though they were privileged to lay mains through it; and the Reigate Company not to supply gas outside their then existing area.

The next important epoch in gas supply was in 1880-85, during which time electricity was introduced, though a supply was not available in Reigate and district until May, 1901. This bracing competition aroused the progressive instinct in the gas fraternity. Electric light stimulated the public appetite for improved illumination, and was thus highly beneficial to the gas industry. One cannot help smiling now at the direful pictures of the downfall of the gas industry that were then drawn.

The output of the Reigate and Redhill Companies increased considerably year by year, and an additional stimulus was given in the early 'nineties by the introduction of the penny-in-the-slot meter, which popularized the use of gas in the artisans' houses.

Amalgamations.

The age of amalgamation is with us, and has proved in all instances of great benefit to the gas consuming public. The year 1921 saw the acquisition of the undertaking of the Reigate Company by the Redhill Company, and 1924 the transfer to the Redhill Company of the Godstone undertaking, giving new limits of supply in the Parishes of Godstone, Tandridge, Crowhurst, and Lingfield (except small specified parts of Godstone and Tandridge parishes).

The manufacture of gas at the Reigate Gas-Works ceased in November, 1922, but the holders there are still used for the storage of gas, and in 1924 part of the buildings were fitted up with modern plant for stove and fire cleaning and repairing. The Godstone Works were shut down in October, 1925. This year, 1928, sees the proposed transfer of the Dorking Gas Company (established in 1871) to the Redhill Company, with a further addition to the limits of supply—the urban district of Dorking and the parishes of Abinger, Capel, Dorking Rural, Newdigate, Ockley, and Wotton, in the Rural District of Dorking, also part of the parishes of Effingham and Mickleham, and of Fetcham, Great Bookham, and Little Bookham.

With this amalgamation will come the change of the name to "The East Surrey Gas Company," as more fitly describing the area of supply, which will then be increased to about 120 sq. miles, and the length of mains to nearly 200 miles, in size from 15 in. diameter downwards, of which total 16 miles are steel high-pressure mains.

MACHINE TOOL AND ENGINEERING EXHIBITION.

A Few of the Exhibits Described.

The Fourth Machine Tool and Engineering Exhibition, organized by the Machine Tool Trades Association, of 70, Victoria Street, S.W. 1, was opened at Olympia on Sept. 5 by the Rt. Hon. W. C. Bridgeman, P.C., M.P., and will remain open till Sept. 22. Though most of the exhibits are of purely general interest, and are composed for the most part of lathes and cutting machines of various makes, several of the stands are of interest to the gas engineer.

Gas-Heated Furnaces.

Brayshaw Furnaces and Tools, Ltd., of Manchester, for example, have an excellent display of their gas-heated furnaces. These include an automatic conveyor furnace embodying new principles and design. Trucks containing the work are charged into the furnace, passed through the hot chamber, tipped at the far end to unload the work, and then returned to the charging door, reloaded, and again charged into the furnace without serious loss of heat. The rate of travel through the furnace is adjustable at will. The trucks, which form the furnace floor, are returned from the discharging end to the loading end so quickly that their heat is maintained; and this results in rapid heating of the work and low fuel consumption. No heat is dissipated by the conveyor mechanism, and the working parts are not liable to deterioration. The furnace is fitted with automatic temperature control. On the same stand is the "Lopress" recuperative furnace of improved design, which is specially suitable for annealing, case-hardening, heat treatment, &c. The low gas consumption of this furnace is due to efficient insulation and recuperation. Salt bath furnaces, forging furnaces, oven furnaces, crucible tilting furnaces, temperature measuring instruments, and gas flow indicators are also to be seen on the stand of this firm.

Compressors.

Messrs. Reavell & Co., Ltd., of Ipswich, have an exhibit of varied interest which includes a vertical two-stage compressor of the double acting type designed for pressures up to 120 lbs. per sq. in. Two sizes of the latest design of "Quadruplex" compressor are shown, the smaller of which supplies air for demonstrating pneumatic tools. These machines have recently been re-designed, so as to make them suitable for running at higher speeds, and they are now fitted with roller bearings throughout. Other exhibits of this firm include vertical compressors varying in capacity from 4 c.ft. to 170 c.ft. per minute, suitable for pressures up to 100 lbs. per sq. in., and a "Reavell Askania" regulator fitted with an impulse system of the Bourdon tube type which will maintain constant a pressure of 30 to 35 lbs. per sq. in.; the pressure before the valve varying from (say) 40 to 100 lbs.

Chain Drives

A good display is made by Messrs. Hans Renold, of Didsbury, who show their stock drives—chain drives made up of two wheels, and the necessary length of chain suitable for transmitting power up to 100 H.P. at various speeds and ratios. Two types of chain are exhibited—bush roller and inverted tooth—and drives are suitably mounted to demonstrate the accuracy of engagement with the wheel teeth, and the smooth and regular turning of the drives.

"Cling Surface"—an internal treatment for all kinds of belt—is shown by Messrs. Thomas & Bishop, Ltd. This, the makers claim, enables belts to be run slack without the slightest fear of slip even while transmitting full load. "Permac," a metal-to-metal jointing material in powder form, for flange and screwed joints, is also exhibited.

The "P.I.V." Gear.

The stand of P.I.V. Chain Gears, Ltd., attracts much interest. Here are shown in motion totally enclosed "P.I.V." (positive infinitely variable) gears of 10, 5, and 3 H.P., with a speed variation in each case of 4 : 1. The smaller gears are fitted with glass covers to facilitate observation of the moving parts and to show the complete manner in which self-lubrication is effected. One such gear is shown fitted with an external attachment which has been designed for the artificial silk industry where, in certain processes, it is of the utmost importance to maintain the tension of the thread at a uniform value during the spinning operation.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The market has indicated a slightly better tendency during the past week, and prospects are now regarded as showing improvement. The shipping position is better, and more boats are becoming available for Tyne trade. This is removing one of the chief difficulties, which has been hampering business for the last few weeks. Turn books are by no means full, and there may still be idle time at many of the collieries; but the position in many respects is likely to show improvement. August is usually regarded as a difficult month, and during the past week inquiry has been much better.

Gas coals are still quiet; but shipments are expected to be on an increased scale from now onwards. Wear Specials quote 15s. 3d. to 15s. 6d. f.o.b. Best qualities are 14s. 9d., and others from 13s. to 13s. 6d. Durham coking coals are still in poor demand, and very quiet at nominally 13s. to 13s. 9d. for unscreened makes, according to quality. Durham unscreened steams are still weak; but inquiry has been rather better lately. Best makes are round 13s. 9d. to 14s. f.o.b., while quite good seconds are obtainable at 13s. to 13s. 3d. Northumberland steams report better turns. Prices quoted are still on the agreed scale, from 13s. 6d. for best screened sorts downwards.

Gas coke is quiet for prompt, at 18s. 9d. to 20s. according to brand. With the improved supply of boats, the market is likely to harden.

YORKSHIRE AND LANCASHIRE.

There has been a steady demand for domestic coal in Yorkshire and Lancashire during the past week. This is considered satisfactory in view of advances recently made. The Doncaster race holiday will result in a firmer market.

Industrial fuels show no material alteration, apart from a stronger demand for washed smalls, which, however, command a better figure for export than for the inland trade.

Values for export in respect of immediate delivery are firm, particularly for hards and all classes of bunkering coal.

With regulated outputs now in operation, gas coals will increase in value for forward contracts. Furnace coke, in view of the shortage in smalls, commands more attention; while collieries in most instances are not prepared to quote ahead.

The following are the Humber bunker and export prices f.o.b. usual shipping ports:

South Yorkshire—Hards, Association, bunkers 20s. to 20s. 6d., export 15s. 6d.; screened gas coal, export 15s. 6d. to 16s.; washed trebles, 13s. 6d. to 16s.; washed doubles, 14s. 6d. to 15s.; washed singles, 13s. 6d. to 14s.; washed smalls, bunkers 15s., export 11s.; rough slack, bunkers 14s. to 14s. 3d.; smithy peas, export 16s. 6d. to 17s. 6d. per ton.

West Yorkshire—Hartley's (f.o.b. Goole), bunkers 15s. 6d., export 14s. to 15s.; screened gas coal, export 14s. to 15s.; washed trebles, 15s. to 15s. 6d.; washed doubles, 13s. 9d. to 14s. 3d.; washed singles, 13s. to 13s. 9d.; washed smalls, bunkers 14s. 6d., export 11s.; unwashed trebles, export 14s. 6d. to 15s.; unwashed doubles, 11s. to 11s. 6d.; rough slack, 8s. 9d. to 9s. 3d.; coking smalls, 8s. 6d. to 9s. 6d. per ton.

Derbyshire and Nottinghamshire—Top hards, bunkers 19s. 6d. to 20s., export 15s. to 16s.; cobbles, 13s. 6d. to 16s.; washed trebles, 15s. 6d. to 16s.; washed doubles, 14s.; washed singles, 13s. 6d.; washed smalls, bunkers 14s. 6d. to 15s., export 11s.; unwashed doubles, export 12s. to 13s.; rough slack, bunkers 14s., export 9s. 6d. to 10s. 6d. per ton.

Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, bunkers 17s. 6d. to 18s. 6d., export 12s. to 13s. 3d.; gas coke, export 20s. to 23s.; furnace coke 19s. to 19s. 6d.; washed steam, (Goole) 15s. to 15s. 6d., (Hull) West Yorks. 17s., and (Hull) South Yorks. 18s. to 18s. 6d. per ton.

MIDLANDS.

Collieries have been busier, chiefly in catering for the London house coal trade. With the broadening of demand from that quarter some Derbyshire and Nottinghamshire collieries which had been forced to make drastic reductions in the summer to maintain connections in the London market have reinstated their former rates, so that the advance looks disproportionately steep. It is merely a reversion to the former relationship, however.

Apart from the London trade, there has been some reaction since the opening of the month. This is ascribed in part to the fact that early needs were anticipated during August by many householders who had stocking accommodation. Merchants state, however, that business has received a check through the claim of collieries to enforce the recent advance on deliveries made from Sept. 1 onwards without regard to the date of order.

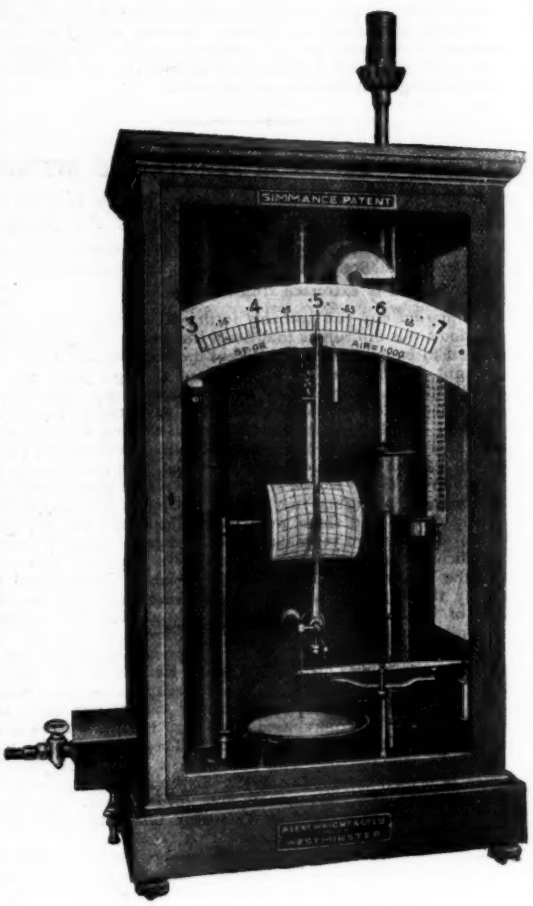
There is little actual change to be noted in the case of industrial fuels. Superabundant stocks have disappeared for the most part, and the market is being closely watched for further indications of the effect of the restriction of output. Coking slacks and the range of slacks from ¾ in. to 2 in. are plentiful, though comparatively few spot lots are offered. D.S. nuts are likewise forthcoming quite as fast as they can be absorbed.

Cheaper Gas at Barnsley.—At the annual meeting of the Barnsley Gas Company it was decided that the price of gas be reduced by 5d. per 1000 c.ft. Slot meter users will receive the return of a halfpenny for every penny they put in the meters. Mr. E. G. Lancaster, who presided, said the Company had not shown a more favourable balance-sheet for years. They were paying the usual half-yearly dividends of 3 p.ct., 3½ p.ct., and 5 p.ct., and in addition the arrears on 1927.

DISTRIBUTION

↓

$$Q = 1350 d^2 \sqrt{\frac{p}{s} \times \frac{d}{l}}$$



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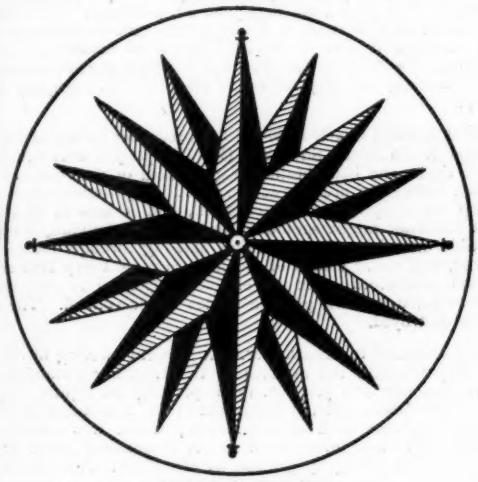

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept.* 10.

Business in tar products continues quiet, and current values are as follows:

Pitch, 47s. 6d. to 50s. per ton.
Creosote, about 7¼d. per gallon.
Pure benzole, about 1s. 8d. per gallon.
Solvent naphtha, 95/160, 1s. 5d. to 1s. 6d. per gallon.
Pure toluole, 1s. 11d. to 2s. per gallon.
Pyridine bases, about 5s. per gallon.

Tar Products in the Provinces.

Sept. 10.

Tar products generally are without alteration.

Pitch is quiet. There is a fair amount of inquiry; but Continental manufacturers are endeavouring still further to depress the market. There does not appear to be any great pressure on the part of English manufacturers to sell, and they are holding for prices varying between 47s. 6d. to 50s. Offers of 45s. are known to have been made and to have been declined.

Water-white products are steady. Practically the entire production of benzole is being sold as motor spirit.

There is a little less demand for toluole than was the case a short time ago. Apparently the addition of 4d. per gallon has caused a diminution in consumption.

Solvent naphtha is still steady at 1s. 1½d. to 1s. 2d. *ex* makers' works.

Creosote oil is quiet, but without any variation in price.

Crude carbolic acid is steady, and business has been done to the end of the year at 2s. 1d. per gallon.

The market for cresylic acid is quiet, and there is not very much inquiry at present.

Naphthalene is steady; but very little business is doing.

The average prices of gas-works products during the week were: Gas-works tar, 35s. to 40s. Pitch—East Coast, 47s. 6d. to 50s. f.o.b. West Coast—Manchester, 41s. 6d. to 42s. 6d.; Liverpool, 43s. 6d. to 45s.; Clyde, 42s. 6d. to 45s. Toluole, naked, North, 1s. 5d. to 1s. 6d. nominal. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 1½d. to 1s. 2d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid, 6d. to 6¼d.; salty, 5⅞d. to 6¼d.; Scotland, 5⅞d. to 6⅛d. Heavy oils, in bulk, North, 8¼d. to 8½d. Carbolic acid, 60 p.c., 2s. 1d. to 2s. 1½d. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.c., purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.		s. d.	
Crude benzole . . .	0 10½	to	0 11	per gallon at works
Motor ,, . . .	1 4½	,,	1 5	,, ,, ,,
90 p.c. ,, . . .	1 7	,,	1 8	,, ,, ,,
Pure ,, . . .	1 10	,,	1 11	,, ,, ,,

TRADE NOTES.

Sands, Clays, and Refractory Materials.

Algernon Lewis Curtis, Westmoor Laboratory, Chatteris, has published a new circular on "Sands, Clays, and Refractory Materials for all Industrial Purposes."

"Radiation" Gas Grates.

From Sept. 1, the prices of "Radiation" gas grates have been reduced; and all particulars of these reductions are given in the new season's illustrated lists of the several Radiation firms.

The Book of the Woodall-Duckham Companies.

In a profusely illustrated booklet which they have just published, the Woodall-Duckham Companies give a description of the various types of plant they construct. There is also a short account of the Woodall-Duckham organization.

Messrs. W. G. Beaumont & Son.

This firm have again been selected as contractors to carry out renovations to the Tower Bridge, Blackfriars Bridge, Southwark Bridge, Monument, and Figure of Justice for the City of London Corporation. Messrs. Beaumont have now had this work under their care for a period of twenty-one years.

"Abbirko" Solid Stocks and Dies.

For some time the gas industry has felt the need for greater accuracy, speed, and ease in cutting screw threads than are given by the ordinary stocks and dies. At least two large gas undertakings in the country have done a great deal of valuable pioneer work in this respect. These Companies demand solid dies (so that the human element of inaccuracy is reduced), accurate thread form, easy starting, and free cutting to gauge diameter, enabling gas-tight joints to be made by unskilled labour without the use of jointing material. All the above requirements, state Messrs. Abbott, Birks, & Co., of 113, Newington Causeway, S.E. 1, have been met in the "Abbirko" No. 118A solid stocks and dies, ranging in size from ⅛ in. to 1 in. British standard pipe thread. Stocks, dies, and all spare parts can be delivered *ex* stock. The firm have published an illustrated leaflet on the subject.

Newcastle Gas Cheaper.—The Directors of the Newcastle and Gateshead Gas Company have decided that a reduction in the price of gas of two-fifths of a penny per therm, or 2d. per 1000 c.ft., shall take place from the readings of the meters next month. This is the second reduction within twelve months.

Proposed Reduction in Price of Glasgow Gas.—The Gas Committee of the Glasgow Corporation have agreed to the recommendation of the Gas Sub-Committee on Finance to reduce the price of gas by 3d. per 1000 c.ft. The proposal will come before the Corporation to-morrow. Should it be approved, the new price will be 3s. 8d. per 1000 c.ft., or 9·362d. per therm.

Price of Gas in Felling.—It was reported by the Finance and General Purposes Committee at a meeting of the Felling Urban District on Sept. 5 that the Secretary of the Newcastle and Gateshead Gas Company had intimated there would be a reduction in the price of gas of two-fifths of a penny per therm, or 2d. per 1000 c.ft., to take effect from the reading of the meters in September. The Council agreed to the Committee's recommendation that the Gas Company be informed that in their opinion the reduction was insufficient.

Cheaper Melton Gas.—At the annual meeting of the Melton Mowbray Gas Light and Coke Company, Ltd., Mr. Shafto H. Sikes, who presided, announced that they had entered into coal contracts at a decrease of 1s. 8d. per ton. This fact and various economies effected would enable them to reduce the price of gas to ordinary consumers from 5s. 5d. to 5s. per 1000 c.ft. from the October readings. They also proposed to make a rebate of 1d. in the 1s. to slot meter consumers from Nov. 1. The profits for the year amounted to £2943, and a final dividend of 20s. per share was declared, making 10 p.ct. for the year (less tax).

Riddings Gas Company.—Mr. Charles H. Oakes, J.P., presiding at the annual meeting of the Riddings, Alfreton, and District Gas Company, congratulated the shareholders on the improved position of the Company and its future outlook. They were able, he said, to show a fair profit on the past year's working, and the Directors looked forward with confidence to the coming year. The profit was £6917, out of which the Directors recommended the declaration of a dividend for the half-year ended June 30 at the rate of 5 p.ct. per annum, less income-tax, on the preference stock, and at the rate of 8 p.ct. per annum, less income-tax, on the ordinary stock. The dividends were declared.

Improved Equipment—Russell Engineering Corporation.—The Improved Equipment Company, of New York, and the Russell Engineering Company, of St. Louis, have been combined in order to meet more adequately the demand for efficient coal gas plants and modern carbonizing equipment. The new organization will be known as Improved Equipment—Russell Engineering Corporation. The new Company will be controlled by the engineering and financial house of Henry L. Doherty & Co. The selling, designing, engineering, and construction work will be handled by the combined personnel of the consolidated Companies. The manufacture of the Improved Equipment Company gas benches, equipped with the Doherty bench fuel economizer, and the horizontal gas ovens of the "Improved Three Section" and "Unit" types, as well as "Russell Built" benches and ovens, will be continued.

Serious Failure of Public Lighting on the Victoria Embankment.—From 8.30 p.m. on Saturday night until Monday last that section of the Victoria Embankment which lies between Blackfriars Bridge and the Temple was without illumination on the river front, owing to the fusing of the electric lighting cables in the London County Council pipe subway which runs the length of the Embankment from Blackfriars to Westminster Bridge. Fire fused an underground electric cable conduit between the Temple Station and Blackfriars, and destroyed over 1000 G.P.O. telephone lines, causing a serious breakdown of the B.B.C. service and serious telephone delays. For more than three hours there was danger of explosion. The pavement collapsed, but the firemen (with gas masks on) and the Gas Light and Coke Company's officers worked energetically, and by the use of sand and chemicals got the fire under control at midnight. All street illumination between Blackfriars and the Temple was extinguished.

Westminster Technical Institute.—The Prospectus of Technical Classes to be held at the Westminster Institute, Vincent Square, S.W. 1, during 1928-29 has been published. For the Education Scheme of The Institution of Gas Engineers, arranged in conjunction with the Board of Education, an approved standard of preliminary education is necessary. The courses of study in Gas Engineering and Gas Supply at the Institute provide preparation for the Ordinary, Higher, and Diploma Examinations. The scheme of the City and Guilds of London Institute comprises examinations in Gas Supply Practice, Gas-Works Practice, and Gasfitting, and adequate provision is made for courses of study in these subjects. The Westminster Technical Institute has for many years worked in close association with the gas undertakings in and around London, and with a staff of highly qualified and experienced teachers has been able to organize courses of study exactly adjusted to the requirements of the various classes of employee in the industry. The laboratories and workshops are equipped with the most modern appliances and apparatus, and make ample provision for the experimental and practical work required by students preparing for the various examinations. The session 1928-29 commences on Monday, Sept. 17. The Principal, Mr. J. Stuart Ker, B.Sc., will be pleased to forward to intending students and others interested in the work of the Institute copies of the prospectus, containing full particulars of the courses of instruction, syllabuses of work, and fees. Intending students should attend at the Institute during the week commencing Sept. 17 to obtain expert advice regarding the courses of study suited to their individual requirements.

Good Results at Clacton-on-Sea.—At a meeting of the Clacton Urban District Council on Sept. 5, the Gas and Water Committee submitted their report and accounts for the year ended March 31, which were adopted. The price of gas was reduced from 4s. 3d. to 4s. per 1000 c.ft. The Engineer and Manager, Mr. Sydney Francis, M.B.E., stated that the year's trading had been very successful indeed. The gas undertaking earned a net profit of £1785. The sale of gas during the year was 120 million c.ft.

Melbourne Gas Company and Street Lighting.—The Melbourne Council have received a letter from the Melbourne Gas Company stating that owing to the curtailment of the number of street lamps to be lit by gas, they wished to modify their previous quotation, increasing it from £3 2s. 6d. to £3 7s. 6d. per lamp. The Company further stated that if there was any future curtailment they would consider whether it was worth their while to submit a quotation for lighting street lamps at all. The Council considered this too great an increase, and they decided to offer the Gas Company £3 5s. per lamp.

Fire at London Gas-Works.—A fire broke out in one of the stove workshops at the South Suburban Gas Company's works at Sydenham last week, and had obtained a good hold of the roof and other woodwork before the fire brigade arrived. A gasholder close to the workshop was emptied as a precaution, and it was at first feared that the outbreak might spread to an adjoining building containing combustible material. The wind was blowing through the centre of the works, and dense clouds of smoke overhung Perry Hill and the main road to Catford. Six fire engines responded to the call, and after half-an-hour's work got the flames under control. The workshop was destroyed.

Street Lighting in Manchester.—At a recent meeting of the Manchester City Council, the minutes of the Lighting Committee contained a reference to a proposal for improving the lighting, by gas, of Birchfields Road; and the Chairman of the Committee refused to accept the reference back of the minute, which was asked for on the ground that fuller information should be obtained about the comparative cost of lighting by gas and by electricity. Alderman Swales pointed out that the capital cost of providing for the conversion of the existing equipment had been estimated by the Gas Committee at £30. If the Committee had decided to introduce electricity, the annual cost would be £591. In the circumstances, he submitted, the Committee had had no choice in the matter. Alderman Walker, who submitted that the only question to be decided was what the Committee were going to get for their money, had suggested that not a single case had ever arisen in the city, relating to the lighting of streets by gas or electricity, in which it had not been proved conclusively that electric lighting was the cheaper. He had submitted further that full details as to candle-power and the cost of maintenance had not been given by the Gas Committee; but on rising to suggest to Alderman Swales that his comparative figures were entirely misleading, he was persistently called to order, and the Council were content to approve of the minutes without listening to Alderman Walker's explanation.

As the result of last year's working, the Clitheroe Gas Committee are recommending a further reduction in the price of gas of 3d. per 1000 c.ft.

The Rhyl Gas Committee are converting into a showroom for their Gas Department a building which was formerly used as a Corn Exchange.

The Chinley Parish Council are again lighting their area by gas in the coming winter, and for this purpose a rate of 3d. in the pound will be levied.

The Kidderminster Gas Company are reducing the price of gas by 4d. per 1000 c.ft., to take effect after the readings of the meters for the current September quarter.

The Gas Committee of the Smethwick Corporation are proposing to erect new distributing station and workshops at the corner of Crocketts Lane and Piddock Road, Smethwick. Tenders for these works are being invited.

The Engineering Union applied to the Blackburn Town Council, on Sept. 6, to increase the wages of the mechanics employed in the Gas Department from 63s. 8d. to 71s. 6d. per week. The matter was left in the hands of the Chairman and Vice-Chairman.

The staff of the London branch of Messrs. J. H. Robinson & Co. (Liverpool), Ltd., went for their annual outing on Saturday last. A very enjoyable day was spent at Reading and a trip to Henley. The Southern Manager, Mr. A. T. Gilbert, attended to represent the firm.

Members and officials of the Great Harwood District Council visited the various undertakings of the Accrington District Gas Board on Sept. 5. They were conducted over the works by Mr. A. J. Harrison, the General Manager, who was accompanied by Alderman Barlow and Mr. A. H. Aitken (Clerk).

In connection with a recent marathon race and carnival, the Barbados Gas Company had a most attractive car depicting the cleanliness and usefulness of gas for cooking as compared with the dirty and soot-ridden kitchens where coal ranges were used. Protected by her gas stove, the housewife could ignore the demands of her cook for exorbitant wages; and "My Lady" could sit at her ease reading the latest picture papers, while her cooking was being done by gas. The various slogans printed round the vehicle were well thought out; and it was undoubtedly one of the best decorative schemes. Twenty bicycles took part in the procession; and they represented, among other things, gas for street lighting, coke, the dirty servant who still uses coal, and the clean servant who cooks by gas.

STOCK MARKET REPORT.

On the Stock Exchange last week investment stocks presented a fairly cheerful appearance. Notwithstanding the monetary uncertainty and the weak exchange, British Funds were firm. The 5 p.ct. War Loan was most favoured, and the price stands at quite a high level. Following the success of the Chilian loan, there was a steady investment demand for Foreign Government securities; Greek and Hungarian loans and Brazilian bonds being noticeably favoured.

The Gas Market displayed a firm tone, and prices continue to improve. It will be noticed from the Table that the transactions were again well up to the average, and, apart from *ex* div. reductions, all changes in quotations were on the up grade. British 7 p.ct. preference headed the list with a rise of 3 points to 114-117. Croydon max. div., Eastbourne 5 p.ct. debenture, Gas Light ordinary, Liverpool ordinary, Newcastle-on-Tyne and Gateshead con., and South Metropolitan ordinary and 8 p.ct. debenture all show improvements. Of the companies operating abroad, Colombo, Ltd., ordinary registered a further advance of 1s., which, added to the gain of 2s. last week, brings the quotation to 35s.-37s. Among other increases Primitiva ordinary gained 3d. to 23s. 9d.-24s. 9d.

Issue.	Share.	When ex-Dividend.	Dividends, Prev. Hf.Yr	Dividends, Last Hf. Yr.	NAME.	Quotations. Sept. 7.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Aug. 30	6	6	Aldershot 5 p.c. max. C.	72—77*	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	68—71*	..	..
1,551,868	,,	Apl. 12	7	7	Alliance & Dublin Ord.	94—97	..	..
574,000	,,	July 12	4	4	Do. 4 p.c. Deb.	68—66	..	..
522,654	,,	Aug. 30	7	7	Barnet Ord. 7 p.c.	109—112*	..	111½
800,000	1	Apl. 26	1/7½	1/7½	Bombay, Ltd.	22/—24/-	..	23/—22/3
170,000	10	Aug. 30	8½	8½	Bournemouth 5 p.c.	12½—13½*	..	..
500,050	10	,,	7	7	Do. B 7 p.c.	12—12½*	..	..
575,000	10	,,	6	6	Do. Pref. 6 p.c.	10½—11½*	..	..
50,000	Stk.	July 12	3	3	Do. 3 p.c. Deb.	56—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..
957,900	,,	Aug. 30	7½	7½	Brighton & Hove 6 p.c. Con.	114—117*	..	..
341,880	,,	,,	6½	6½	Do. 5 p.c. Con.	101—104*	..	103—103½
1,387,500	,,	July 26	5	5	Bristol 5 p.c. max.	90½—91½a	..	..
855,000	,,	Mar. 22	6	7	British Ord.	114—117	..	116
100,000	,,	June 28	7	7	Do. 7 p.c. Pref.	114—117	+3	112
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	78—76	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	94—97	..	..
100,000	10	May 24	6	8	Cape Town, Ltd.	7½—8½	..	8 5/16—8⅝
100,000	10	Apl. 26	4½	4½	Do. 4½ p.c. Pref.	6½—7½	..	6¾
150,000	Stk.	June 28	4½	4½	Do. 4½ p.c. Deb.	70—75	..	..
426,850	,,	July 26	6	6	Cardiff Con. Ord.	96—99	..	..
187,860	,,	June 28	7½	7½	Do. 7½ p.c. Red. Deb.	100—103	..	..
187,150	,,	Aug. 16	6¾	5	Chester 5 p.c. Ord.	88—93b	..	..
79,185	1	Apl. 26	12/-	12/-	Colombo Ltd. Ord.	35/—37/-	+1/-	36/-
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	20/—22/-	..	..
376,402	1	Apl. 12	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	23/—25/-	..	23/3—24/6
187,848	1	,,	1/7½	1/7½	Do. 5 p.c. Pref.	21/—23/-	..	21/6—22.6
2,073,280	Stk.	July 26	7	8	Commercial Ord.	97—100	..	98½—99
475,000	,,	June 14	8	8	Do 8 p.c. Deb.	57—60	..	58½
800,000	,,	Sept. 29	11	11	Continental Union, Ltd.	33—36	..	33
200,000	,,	Mar. 8	7	7	Do. 7 p.c. Pref.	92—97	..	..
787,560	,,	Aug. 16	7	7	Croydon sliding scale	107—110	..	..
408,100	,,	,,	5	5	Do. max. div.	£3—86	+1	85—86
492,370	,,	Aug 16	10	7	Derby Con.	115—120c	..	..
55,000	,,	June 28	4	4	Do. Deb.	71—78c	..	..
209,000	,,	Aug 30	5	5	East Hull Ord. 5 p.c.	75—75*	..	..
50,000	,,	June 28	5	5	Eastbourne 5 p.c. Deb.	94—97	+2	..
1,002,180	10	Mar. 22	14	16	European, Ltd.	8—9	..	..
18,703,480	Stk.	July 26	£/1/4	5½	Gas Light & Coke 4 p.c. Ord.	19/4½—19/10½f	+1½d.	19/4½—19/10½
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	61½—63½	..	62½—63½
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	77—80	..	78½—79½
5,602,620	,,	June 14	8	8	Do. 8 p.c. Con. Deb.	59—62	..	60½—61½
181,818	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	103—106	..	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	99—101	..	101
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
62,500	,,	Aug. 30	6¾	7	Hastings & St L. 5 p.c. Conv	83—93*	..	..
288,748	,,	,,	5½	5½	Do. 5½ p.c. Conv.	71—76*	..	..
70,000	10	Apl. 26	110	110	Hongkong & China, Ltd.	13½—14½	..	..
178,300	Stk.	Aug. 30	5	5½	Hornsey Con. 8½ p.c.	82—84*	..	..
1,976,000	,,	May 24	10	10	Imperial Continental Cap.	170—175	..	172½—174
228,180	,,	Aug. 16	8½	8½	Do. 8½ p.c. Red. Deb.	67—69	..	68½—69
235,242	,,	Aug. 16	7	7½	Lea Bridge 5 p.c. Ord.	98—101	..	..
2,145,907	,,	Aug. 16	8½	8½	Liverpool 5 p.c. Ord.	90—91b	+½	..
600,000	,,	Mar 22	7	7	Do. 7 p.c. Red. Pref.	103½—105½b	..	104—104½
165,786	,,	Aug. 16	8	9	Maidstone 5 p.c. Cap.	112—117	..	..
63,480	,,	June 14	3	3	Do. 3 p.c. Deb.	55—56	..	56
75,000	5	June 14	18	18	Malta & Mediterranean	6½—8½	..	..
641,920	Stk.	May 24	15	17	Montevideo, Ltd.	94½—96½	..	94½—95
2,061,315	,,	Aug. 16	5	5	Newcastle & Gateshead Con.	16/—16/9df	+1½d.	16/3—16/6
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	73—74d	..	72½
891,708	,,	June 28	8½	8½	Do. 8½ p.c. Deb.	66—67d	..	..
131,780	,,	Aug. 30	6/18/0	7/1/0	North Middlesex 6 p.c. Con.	98—99*	..	..
300,000	,,	Apl. 26	9	7	Oriental, Ltd.	115—118	..	116½
188,120	,,	June 28	7½	7½	Plym'th & Ston'house 5 p.c.	107—112	..	..
414,800	,,	Aug. 30	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	99—102*	..	..
286,732	,,	,,	5	5	Do. 5 p.c. max.	76—79*	..	..
2,334,154	1	—	—	—	Primitiva Ord.	23/9—24/9	+3d.	24/—24/6
244,500	100	June 1	4	4	Do. 4 p.c. Red. Deb.	91—94	..	..
695,000	Stk.	July 26	4	4	Do. 4 p.c. Red. Deb. 1911	78—80	+2	..
416,345	,,	June 28	4	4	Do. 4 p.c. Cons. Deb.	78—80	+3	..
150,000	10	Mar. 22	6	6	San Paulo 6 p.c. Pref.	8½—8¾	..	..
270,000	Stk.	Mar. 22	6	6	Sheffield A	103½—104½e*	−1	..
419,968	,,	,,	6	6	Do. B	103½—104½e*	−1	..
1,047,000	,,	,,	6	6	Do. C	103½—104½e*	−1	..
90,000	10	June 14	13	14	South African	4—6	..	..
6,602,895	Stk.	July 26	7½	5	South Met. Ord.	106 108	+1	106—107
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	110—113	..	111½—112
1,895,445	,,	July 12	8	8	Do. 8 p.c. Deb.	59—61	+½	60
734,000	,,	Mar. 8	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	..
91,500	,,	Aug. 16	8½	8½	South Shields Con.	107—109d	..	..
1,245,795	,,	July 26	6½	8½	South Suburban Ord. 5 p.c.	105—108	..	..
868,897	,,	June 28	5	5	Do. 5 p.c. Deb.	97 100	..	..
647,740	,,	Aug. 30	5	5	South'mpton Ord. 5 p.c max	17—79*	..	..
121,275	,,	June 28	4	4	Do. 4 p.c. Deb.	72—75	..	..
950,000	,,	Aug. 30	7	7	Swansea 7 p.c. Red. Pref.	98—101*	..	..
200,000	,,	June 28	6½	6½	Do. 6½ p.c. Red. Deb.	99—102	..	..
125,000	,,	July 26	7½	8	Tottenham District A 5 p.c.	116—121	..	..
882,276	,,	,,	6½	6½	Do. B 8½ p.c.	97—100	..	..
150,000	,,	,,	6½	6½	Do. 6½ p.c. Pref.	96—99	..	..
121,355	,,	June 14	4	4	Do. 4 p.c. Deb.	76—79	..	..
981,094	,,	Aug 30	6 5/16	£7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	89—94*	..	..
88,830	,,	,,	5	5	Do. 5 p.c. pref.	£5—89*	..	..
80,000	,,	July 12	8½	£3	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	126—129	..	..
255,688	,,	,,	7	7½	Do. B 5½ p.c.	108—113	..	..
437,585	,,	,,	5/19/0	6½	Do. C and New	£6—101	..	..
852,000	,,	,,	6⅝	6⅝	Do. Wimbledon 5 p.c.	104—103	..	106—107
98,000	,,	,,	7⅛	7⅛	Do. Epsom 5 p.c.	110—115	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref	88—91	..	..
88,416	,,	June 28	3	3	Do. 3 p.c. Deb.	56—59	..	..
284,748	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of Stock. * Ex div. † Paid free of income-tax. ‡ For year.

On Monday, Bombay 23s. 3d., Colombo 36s., Colonial 23s. 6d., 8 p.ct. preference 21s. 6d., Commercial 99, 3 p.ct. debenture 58½, Croydon max. div. 85, 86, Gas Light and Coke 19s. 4½d., 19s. 6d., 19s. 7½d., 19s. 8½d., 19s. 9d., 19s. 9½d., 3½ p.ct. max. 63½, 3 p.ct. cons. deb. 60⅜, 61⅛, 5 p.ct. debenture 101, Liverpool 7 p.ct. preference 104, Maidstone 3 p.ct. debenture 56, Newcastle-on-Tyne and Gateshead 4 p.ct. preference 72¼, Oriental 116½, Primitiva 24s., 24s. 4½d., 24s. 6d., South Metropolitan 106½, 106⅝, 107. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 101, Liverpool 5 p.ct. standard 90.

On Tuesday, Brighton and Hove 5 p.ct. 103, British 116, 7 p.ct. preference 112, Cape Town 8 5/16, Commercial 85¾, 89, Gas Light and Coke 19s. 6d., 19s. 7½d., 19s. 8½d., 19s. 9d., 19s. 9¾d., Montevideo 94½, Newcastle 3½ p.ct. 16s. 3d., Primitiva 24s., 24s. 1½d., 24s. 2¼d., 24s. 3d., 24s. 4½d., South Metropolitan 106, 106½, 107. Supplementary prices, Croydon 7½ p.ct. preference 102, 102¼, Gas Light and Coke 5 p.ct. debenture 101.

On Wednesday, Brighton and Hove 5 p.ct. 103¾, Cape Town 8⅝, Colonial 24s. 6d., 8 p.ct. preference 22s. 6d., Continental Union 33, Croydon max. div. 86, Gas Light and Coke 19s. 7½d., 19s. 9d., 19s. 10½d., 4 p.ct. preference 79¼, 5 p.ct. debenture 101, Liverpool 7 p.ct. preference 104⅜, Newcastle 3½ p.ct. 16s. 6d., Primitiva 24s., 24s. 3d., 24s. 4½d., 24s. 6d., South Metropolitan 106½. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 101, Liverpool 5 p.ct. 90¾, Metropolitan 5½ p.ct. debentures (issued at £100, £50 paid), 50.

On Thursday, Barnet 111½, Bombay 23s., Cape Town 4½ p.ct. preference 6⅝, Gas Light and Coke 19s. 6d., 19s. 7¾d., 19s. 9d., 3½ p.ct. max. 62½, 63, 4 p.ct. preference 78¾, 3 p.ct. debenture 60⅜, Imperial Continental 172½, 173, 3½ p.ct. debenture 68¼, Primitiva 24s. 1½d., 24s. 4½d., South Metropolitan 106½, 6 p.ct. preference 111½, 112, 3 p.ct. debenture 60, Wandsworth (Wimb.) 5 p.ct. 106. Supplementary prices, Gas Light and Coke 5 p.ct. red. debenture, 1952/7, 101, Liverpool 5 p.ct. 90, Metropolitan (of Melbourne) 5½ p.ct. debentures (issued at £100, £50 paid), 50, Tottenham 7½ p.ct. reg. morts. 101.

On Friday, Continental Union 33, Gas Light and Coke 19s. 6d., 19s. 8½d., 19s. 9d., 3½ p.ct. max. 62¼, 63½, 4 p.ct. preference 79¼, 3 p.ct. debenture 60¼, 5 p.ct. debenture 101, Imperial Continental 174, 3½ p.ct. debenture 69, Montevideo 95, Primitiva 24s., 24s. 1½d., 24s. 3d., 24s. 4½d., South Metropolitan 106½, 106⅝, Wandsworth (Wimb.) 5 p.ct. 107. Supplementary prices, Ascot orig. (10 p.ct.) 10 5/16, Gas Light and Coke 5 p.ct. debenture 101, Metropolitan (of Melbourne) 5½ p.ct. debentures (issued at £100, £50 paid) 50, Woking 10 p.ct. standard "A" 127½, 7 p.ct. standard "B" 94½.

Money was quite plentiful in Lombard Street, and the rate for both old and new loans from lenders other than the clearing banks fell from 3¼ p.ct. to 3 p.ct. Only £35,000,000 Treasury Bills were offered, but applications were normal. The average rate at which the Bills were allotted—£4 4s. 7·89d. p.ct. was about 7½ p.ct. below the previous week's rate. The reduction had no effect on discount rates.

The feature of the Foreign Exchange Market was the weakness of the New York rate. There was a further decline on balance, and the rate closed at 4.85⅛. The Dutch currency reacted, and the Amsterdam rate closed ⅛c. higher at 12.10½. The German rate closed slightly lower at 20.36, and French francs also declined to 124.22½. Belgas closed at 34.89¾, and pesetas at 29.26, while Italian lire finished at 92.69½.

Silver lacked support, and the price declined to 26½d. per oz. There were no Gold transactions, and the price remained nominally at 84s. 11½d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21, 1927. The Banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

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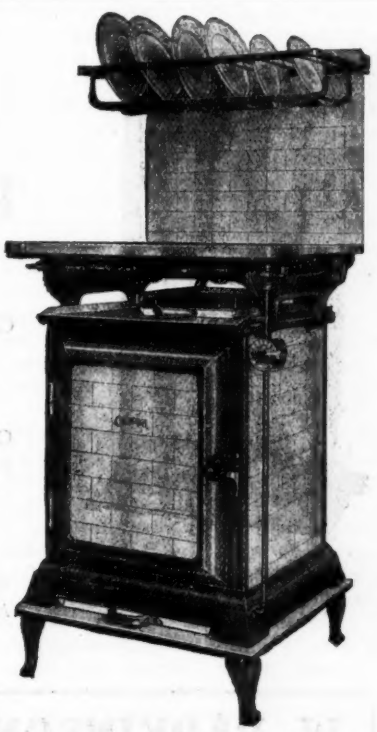

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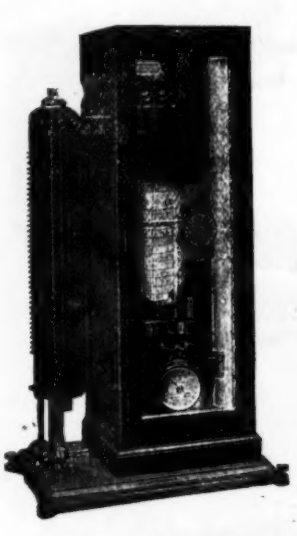

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